

DEPARTMENT OF THE NAVY – NAVFAC SOUTHWEST
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**FINAL
WORK PLAN
SCAPS LASER INDUCED FLUORESCENCE
TARRY REFINERY WASTE INVESTIGATION
FORMER OIL REFINERY
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

Contract Number: N68711-03-D-4302

**Task Order: 237018
NAVFAC SW CTO 0066**

DCN: RBAE.4302.7018.0011

OCTOBER 17, 2007

Prepared by:

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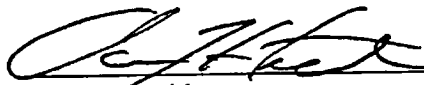
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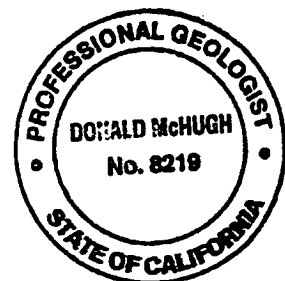
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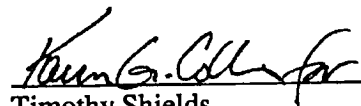
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APPENDIX

Appendix A Responses to Agency Comments on the Draft Work Plan

ATTACHMENTS

Attachment A Final Sampling and Analysis Plan
Attachment B Final Health and Safety Plan

ACRONYMS/ABBREVIATIONS

AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, xylenes
bgs	below ground surface
BRAC	Base Realignment and Closure
BRAC PMO	Base Realignment and Closure Program Management Office
BSU	Bay Sediment Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPT	cone penetrometer test
CSM	conceptual site model
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EBS	Environmental Baseline Survey
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSP	Field Sampling Plan
GAP	generator accumulation point
GPS	global positioning system
HASP	Health and Safety Plan
IR	Installation Restoration
JP	jet propellant
LIF	laser-induced fluorescence
mg/kg	milligrams per kilogram
NACIP	Navy Assessment and Control of Installation Pollutants
NADEP	Naval Aviation Depot
NAVFAC SW	Naval Facilities Engineering Command Southwest
OU	Operable Unit
OWS	oil water separator
PAH	polynuclear aromatic hydrocarbon
pH	potential of hydrogen
PRC	preliminary remediation criteria

PRG	preliminary remediation goal
PWC	(Navy) Public Works Center (San Diego)
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	remediation alternatives
RBA	Richard Brady & Associates
RI	Remedial Investigation
RV	recreational vehicle
SAP	Sampling and Analysis Plan
SCAPS	Site Characterization and Analysis Penetrometer System
SWMU	solid waste management unit
TBD	to be determined
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TRW	tarry refinery waste
UST	underground storage tank
VOC	volatile organic compound
Waterboard	Regional Water Quality Control Board

1.0 INTRODUCTION

This Preliminary Draft Work Plan has been prepared by Richard Brady & Associates (RBA) for a Site Characterization and Analysis Penetrometer System (SCAPS) Laser Induced Fluorescence (LIF) Investigation at Installation Restoration (IR) Site 13, Alameda Point, Alameda, California (Figure 1-1). This plan was prepared under subcontract to Shaw Environmental, Inc., for Naval Facilities Engineering Command Southwest (NAVFAC SW) and Base Realignment and Closure Program Management Office West (BRAC PMO West). This Work Plan has been prepared in general accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

1.1 Investigation Objectives

Several environmental investigations have identified the presence of black, tarry, and asphaltic residues in soils within IR Site 13 (Figure 1-2). These observations are supplemented by analytical results, which demonstrate elevated levels of petroleum-related compounds associated with the residues. The residue is believed to be tarry refinery waste (TRW) disposed of at the site during historic oil refinery operations. The objectives of this investigation are to adequately define the extent of and adequately characterize the chemical nature of the TRW. Understanding the nature and extent of the TRW will support the detailed remedial alternatives analysis in the Operable Unit 2A (OU-2A) Feasibility Study (FS).

1.2 Scope of Work

The existing data set leaves uncertainty regarding the thickness, spatial distribution, and variation in the chemical nature of the TRW disposed of during historic oil refinery operations at IR Site 13. These uncertainties in the conceptual site model (CSM) increase the difficulty of the decision making process when preparing planning documents for the site.

The Navy has identified the SCAPS LIF technology as being appropriate to provide additional data that will reduce uncertainty about the distribution of TRW.

The purpose of the proposed SCAPS LIF investigation is to provide data that will be used to update and refine the CSM including: increasing resolution of the horizontal and vertical extent of petroleum contamination (including TRW), sampling limited locations to verify the concentration and type of contaminants of concern on-site, and determining useful monitoring well locations (if monitoring wells are required or recommended in the future). The criteria that may be applied when selecting sampling locations are provided in Section 4.1.1, Sampling Rationale, and Table 4-1 of the SAP.

The data from this investigation will be used to refine the CSM. By filling data gaps in the CSM, the decision making process will be optimized when preparing future planning documents for IR Site 13.

The primary objectives of this proposed investigation are to promote increased resolution regarding the extent of TRW and associated chemical constituents related to the historic release,

as well as to fill data gaps identified during the RI/FS process. In order to meet these objectives, the following tasks are proposed:

- 1) The SCAPS investigation will proceed by pushing the LIF probe at approximately 300 locations to approximately 15 feet below ground surface (bgs). The florescence intensity will be compared to background data to determine the presence of TRW contamination.
- 2) A minimum of 5 percent solid soil and, or TRW matrix samples will be collected from SCAPS push locations and analyzed for total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), lead, polynuclear aromatic hydrocarbons (PAHs), metals and general chemistry parameters by a fixed-based laboratory. Soil and TRW matrix sample locations will be selected based on real-time data to evaluate SCAPS LIF effectiveness and reduce uncertainty in the data set. All soil and TRW matrix data obtained during the planned investigation will be independently validated in accordance with the Navy IR Program guidelines for data validation.
- 3) The existing CSM will be refined using newly obtained data and usable historical data. This task will allow for optimization of the CSM.

1.3 Regulatory Status

The Navy initiated site investigations at Alameda Point under the Navy Assessment and Control of Installation Pollutants (NACIP) Program in 1982. On June 6, 1988, the Navy received a Remedial Action Order from the California Department of Health Services (currently the Department of Toxic Substance Control (DTSC)) that identified a total of 20 sites, which included IR Site 13, as needing a RI and FS in conformance with requirements set forth in CERCLA.

In 1988, the Navy converted its NACIP Program into the IR Program to be more consistent with CERCLA. Alameda Point was identified for closure in September 1993, and all naval operations ceased in April 1997. In July 1999, Alameda Point was identified as a National Priorities List site by the United States Environmental Protection Agency (EPA). The Navy is currently conducting investigations in accordance with CERCLA at 35 sites at Alameda Point, including IR Site 13 (Tetra Tech, 2003).

The Navy is the lead agency. Regulatory agencies providing oversight are from the California DTSC, San Francisco Bay Regional Water Quality Control Board (Water Board), and the United States EPA Region 9. Responses to agency comments on the Draft Work Plan are provided as Appendix A.

1.4 Project Organization and Responsibilities

Ms. Michelle Hurst is the Remedial Project Manager at BRAC PMO West. A project organization chart and brief descriptions of key project team member qualifications and responsibilities are included in the Sampling and Analysis Plan (SAP) (Attachment A).

1.5 Project Schedule

The currently proposed schedule, subject to change based on direction from the Navy or adjustments due to field conditions, is:

- July 6 through August 9, 2007 - Regulatory Partner Review of the Final Project Plans
- August 13 through 31, 2007 - Responses to Agency Comments and Resolution of Any Outstanding Agency Comments
- September 6, 2007 - Submittal of the Final Project Plans to the Navy and the Regulatory Partners

Field work will commence as soon as possible after regulatory partner approval of Final Project Plans. The currently forecasted schedule has field work performed during two 10-day deployments within the period of September 14 through October 31. Current plans are:

- September 12 through 13, 2007 - Mobilization Activities
- September 14 through 27, 2007 – Field Deployment 1, Tentative
- October 4 through 17, 2007 – Field Deployment 2, Tentative
- October 30 through 31, 2007 - Demobilization Activities, Tentative.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

This section summarizes background information associated with IR Site 13 including site description and history, physical setting, regulatory history, previous investigations, geology and hydrogeology. This information provides the basis for development of the preliminary CSM presented in Section 3 of the SAP (Attachment A).

2.1 Site Location and Description

Alameda Point is located at the western end of Alameda Island near the northwestern corner of Alameda County, California (Figure 1-1). Alameda Island is located at the eastern edge of San Francisco Bay adjacent to the City of Oakland. Alameda Point is approximately 2 miles long and 1 mile wide, and occupies 2,634 acres.

Originally a peninsula, Alameda Island was detached from the mainland in 1876 when a channel was cut to link San Leandro Bay with the San Francisco Bay. The northern portion of Alameda Island was formerly tidal areas, marshlands, and sloughs adjacent to the historic San Antonio Channel, now known as the Oakland Inner Harbor. During the late 1800s, the eastern portion of the base was used for industrial purposes. Specifically, the Pacific Coast Oil Company operated a refinery along the western shore of the island (SulTech, 2005a).

IR Site 13 is situated about 1,000 feet east of the Seaplane Lagoon and lies at the center of OU-2A (Figure 1-2). The site is approximately 17.5 acres in size, relatively flat, partially paved, and comprises primarily open space with several structures. IR Site 13 includes former jet engine test cells in Building 397, a self storage area (Buildings MS-01 through MS-10), a recreational vehicle (RV) park, the Naval Aviation Depot (NADEP) generator accumulation point (GAP) 62 (a temporary hazardous waste storage area); oil water separators (OWSs) 397A, 397B, and 397C; and several storm sewer lines. No structures from the former oil refinery remain at IR Site 13.

Currently, approximately 90 percent of IR Site 13 consists of open space. Approximately half of the ground surface is exposed soil, and the other half is paved with asphalt or concrete with some minor areas of exposed soil and weeds. Current uses for the site include vehicle parking, storage, and a bicycle path (SulTech, 2005a).

2.2 Historical Site Use and Operations

IR Site 13 encompasses the majority of the former location of the Pacific Coast Oil Works Company Refinery, which operated from 1879 to 1903. The refinery formerly occupied IR Site 13 as well as adjoining IR Sites 19, 22, and 23. Historic fire insurance maps show the location of the refinery structures, which consisted of pump and lubricant houses, two laboratories, agitators, and bleaching tanks, as well as 19 iron aboveground storage tanks (ASTs), 6 iron underground storage tanks (USTs) and a storage area containing drums of oil (Sanborn, 1897). The former tanks were used to store crude oil and finished products, as well as for processes such as bleaching and condensing (Figure 1-2). The majority of refinery operations occurred in the southern portion of IR Site 13. Petroleum refinery operations in the late 1800s consisted of distilling crude oil to kerosene and fuel oil. Wastes from this type of operation would be

expected to include heavier-end hydrocarbons that weather to an asphaltic-like consistency. The type and quantity of wastes and location of disposal are not documented; however, it is reasonable to assume that the refinery wastes and asphaltic residues were disposed of at the site, the surrounding tidal lands, and the native sediments of San Francisco Bay (SulTech, 2005a).

In February 1991, heavy rains resulted in a storm drain overflow in the vicinity of Building 397. The pool that formed was covered with a layer of free phase hydrocarbon that was later determined to be jet propellant (JP)-5 fuel that was released by an open drain valve on the jet fuel supply line in the building's fuel room. A complete investigation of this jet fuel release was conducted in March, 1991 by RC Environmental Management, Inc. (PRC, 1992).

Located to the south, within Site 23, is Building 530, which operated as a missile rework facility. The paved area directly west of Building 530 was used for aircraft defueling between 1958 and 1985 (Tetra Tech, 2003). To the east of Building 530 is the mini-storage area, also within the boundaries of IR Sites 13 and 23. The area is currently occupied by rows of cinder-block storage structures, and little is known about historic use of this area.

2.3 Environmental Setting

This section summarizes the regional setting and topography, land use, climate, geology, and hydrogeology, and biological setting.

2.3.1 Regional Setting and Topography

Alameda Point is located at the western end of Alameda Island, which lies at the base of a generally western-sloping plain that extends from the Oakland-Berkley hills on the east to the shore of the San Francisco Bay on the west (Figure 1-1). The island is also bordered by the San Francisco Bay to the south, and the Oakland Inner Harbor to the north (Tetra Tech, 2003).

IR Site 13 is relatively flat and is at an elevation of approximately 8 feet above mean sea level.

2.3.2 Land Use

Physical features at Alameda Point include runways, streets, buildings, fuel lines, USTs, ASTs, utility lines (sanitary sewer, storm sewer, water, and power lines). Some fuel lines, USTs, and ASTs have been removed, and others have been closed in place (Tetra Tech, 2003).

2.3.3 Climate

The San Francisco Bay Area (Bay Area) experiences a maritime climate, with mild summer and winter temperatures. Prevailing winds in the Bay Area are from the west. Because of the varied topography in the Bay Area, climate conditions vary considerably throughout the region. Heavy fogs occur on an average of 21 days per year. Rainfall occurs primarily during the months of October through April. The installation averages about 18 inches of rainfall a year. There are no naturally occurring surface streams or ponds on the installation, so precipitation either returns to the atmosphere by evapotranspiration, runs off into the storm drain system that discharges into the San Francisco Bay, or infiltrates to groundwater (Tetra Tech, 1998).

2.3.4 Geology

The subsurface materials historically encountered at IR Site 13 primarily consist of interbedded sand, silt and clay layers. Bedding appears to be somewhat continuous, but irregular over the site [(Navy) Public Works Center (PWC), 1997].

Artificial fill consisting primarily of silty sand is the uppermost lithologic unit that underlies most of IR Site 13. Below the artificial fill is a naturally occurring unit consisting of grey to black silt and clay known as the Bay Sediment Unit (BSU). The BSU reaches a maximum thickness of approximately 9 feet at the site. A layer of sediment contaminated by petroleum wastes, known as the "Marsh Crust", typically marks the top of the BSU throughout the site. Underlying the BSU, a layer of poorly graded sand known as Merritt Sand, is found at a maximum thickness of 80 feet below the majority of the site. The lower member of the San Antonio Formation (Yerba Buena Mud), consisting of fat clay, occurs below the Merritt Sand at approximately 100 feet bgs at IR Site 13 (SulTech, 2005a).

2.3.5 Hydrogeology

Groundwater is very shallow (less than 10 feet bgs) at Alameda Point. The groundwater is in hydraulic communication with San Francisco Bay and is influenced by tidal fluctuations in the bay. Depth to groundwater has been reported in previous investigations at IR Site 13 as being approximately 6 feet bgs. Groundwater flow across the site is anticipated to be west towards San Francisco Bay (PWC, 1997).

2.4 Previous Investigations and Removal Actions

A total of 13 previous investigations and 5 removal actions have occurred at Alameda Point IR Site 13. Information regarding these previous investigations and removal actions are presented in Sections 2.4 and 2.5 of the SAP (Attachment A).

3.0 SITE EVALUATION

This section summarizes the identification of potential contaminants of concern, potential sources of contamination, the extent of TRW impacted soil, and presents the conceptual site model.

3.1 Identification of Potential Contaminants of Concern

The objective of contamination identification is to isolate contaminants of potential concern (COPCs) based on available site usage or processing history of hazardous substances or waste. The principal contaminant at IR Site 13 is TRW. Other potential COPCs found or suspected at the site include petroleum hydrocarbons, VOCs, PAHs, and metals.

3.2 Potential Sources of Contamination

Based on previous investigations and removal actions discussed in Sections 2.4 and 2.5 of the SAP (Attachment A), the potential source of TRW contamination at IR Site 13 is the former oil refinery and its operational processes and disposal practices.

3.3 Extent of TRW Impacts

TRW has been observed during numerous investigations at IR Site 13; however, there is uncertainty regarding the thickness, spatial distribution, variation, and chemical nature of the TRW. One of the primary goals of this SCAPS LIF investigation is to define the extent of TRW impacts at the site.

3.4 Conceptual Site Model

The initial CSM for IR Site 13 was developed during the RI process in an interactive approach by conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps (Figure 3-1). This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors (SulTech, 2005a).

Through environmental investigations and literature searches, physical features and activities at IR Site 13 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination during the RI process:

- Oil refinery operations and disposal practices Former location of the Pacific Coast Oil Works Company Refinery that used an acid-sludge process for refining fresh crude oil. The refinery was a potential source of crude oil, kerosene, lubricating and fuel oils, and heavier-end hydrocarbons, including TRW.
- Former ASTs 324 through 328 (AOC 009) These ASTs were located in the eastern portion of IR Site 13 in the area used for aircraft storage. The capabilities and contents of

the tanks are unknown; however, recent research conducted to support remediation in this area under the TPH program indicates that these tanks held dry storage (Shaw, 2007).

- Building 397 and associated OWSs 397A, 397B, 397C, and 397D Located in the northwest portion of IR Site 13; this was an aircraft overhaul plant services facility, and was a potential source of petroleum products, halogenated and nonhalogenated solvents, and aircraft fuel (JP-5).
- NADEP GAP 62 This was a nonpermitted RCRA GAP located in the west end of Building 397 that was used as a temporary storage area for 30- to 55-gallon drums containing hazardous waste, including Mil-L-23699 lubrication and engine oil. The Phase I Environmental Baseline Survey (EBS) concluded that the site did not require further investigation and no further action was recommended in the solid waste management unit (SWMU) Evaluation Report (SulTech, 2005a).
- Placement of dredged fill material used to build the island Potential source of PAHs.

As presented in the Final RI Report (SulTech, 2005a), exposure pathways and primary and secondary release mechanisms may include the following:

- Direct release of petroleum product acids (such as sulphuric acid), PAHs, and possibly metals associated with oil refinery activities to soil.
- Direct release of petroleum products to soil and groundwater from spills around Building 397 and associated OWSs 397A, 397B, 397C, and 397D. A spill occurred during which 3,500 to 17,000 gallons of JP-5 was released from a drain valve in the eastern end of Building 397 to a floor drain connected to OWSs 397A, 397B, and 397C, which in turn drained into the storm sewer system. The jet fuel at Building 397 is not considered a CERCLA waste.
- Placement of fill material that potentially contained PAHs.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration.
- Secondary release from groundwater to air through volatilization.

The primary objective of this investigation is to promote increased resolution regarding the extent of TRW and associated chemical constituents related to the historic release at IR Site 13. TRW has historically been observed in borings, test pits, and seeping onto the ground surface at several locations at IR Site 13. The material is black and globular in nature with strong hydrocarbon odors. Chemicals associated with TRW include TPH, benzene, toluene, ethylbenzene, xylenes (BTEX), PAHs, and lead. In addition, potential of hydrogen (pH) values

as low as 1.1 have been reported in samples collected below the site. Black and gray sand has also been observed surrounding the TRW. Samples from stained sands have historically contained elevated concentrations of TPH, xylene, ethylbenzene, and PAHs, indicating that chemicals present in TRW have diffused into nearby soil (SulTech, 2005a).

As discussed in Section 2.3.4 Geology, artificial fill consisting primarily of silty sand is the uppermost lithologic unit that underlies most of IR Site 13. Below the artificial fill is a naturally occurring unit consisting of grey to black silt and clay known as the Bay Sediment Unit (BSU). The BSU reaches a maximum thickness of approximately 9 feet at the site. A layer of sediment contaminated by petroleum wastes, known as the "Marsh Crust", typically marks the top of the BSU throughout the site. Underlying the BSU, a layer of poorly graded sand known as Merritt Sand, is found at a maximum thickness of 80 feet below the majority of the site. The lower member of the San Antonio Formation (Yerba Buena Mud), consisting of fat clay, occurs below the Merritt Sand at approximately 100 feet bgs at IR Site 13 (SulTech, 2005a).

Depth to groundwater has been reported in previous investigations at IR Site 13 as being approximately 6 feet bgs. Two water bearing units have been described at IR Site 13, a First and Second water bearing zone (ITSI, 2007). A groundwater elevation map from the most recent basewide sampling event is shown on Figure 3-1 (ITSI, 2007). A conceptual site hydrogeologic model for the Alameda Point OU-2A area, including IR Site 13, has been provided as Figure 3-2.

4.0 TECHNICAL APPROACH

Execution of environmental assessment tasks will follow standard technical guidelines to meet program-specific needs and to comply with existing regulatory requirements. Data Quality Objectives (DQOs) and general project technical requirements have been established in the SAP (Attachment A). The DQO process is a series of planning steps based on scientific method and designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended application.

The DQOs are then used to develop a scientific and resource-effective sampling design. DQOs for this investigation have been developed in accordance with the EPA seven-step DQO process (EPA, 2000). A detailed description of the project DQOs is included in the SAP (Attachment A). DQOs are qualitative and quantitative statements derived from the outputs of each step of the DQO process that:

- Clarify the study objective,
- Define the most appropriate type of data to collect,
- Determine the most appropriate conditions at which to collect the data, and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP) have been combined into one document, the project-specific SAP (Attachment A). The SAP will be followed in order to achieve a consistent technical approach in the field investigation phase.

Subcontractors for underground utility surveying, analytical laboratory testing, and management of investigation-derived wastes will be evaluated, selected, and scheduled for fieldwork.

After data from the proposed site assessment and field investigation work have been obtained and evaluated, project efforts will focus on preparation of a project report, which will contain the findings, conclusions, and recommendations pertaining to the site.

4.1 Sampling Locations, Analyses, and Rationale

The selection of sampling locations and analytical methodologies was based on the nature of the contaminants and potentially contaminated media at the site. Analytical methods were selected on the basis of site operation practices and compounds identified during previous investigations, and to accomplish the SCAPS LIF Investigation objectives and achieve desired detection limits. A detailed discussion of analytical methodologies, including a tabulation of analytical methods, target method detection limits, and project-specific threshold levels, is provided in the SAP (Attachment A).

This investigation is designed primarily to use field methods, specifically SCAPS LIF, to delineate the nature and extent of TRW contamination. SCAPS LIF and cone penetrometer test

(CPT) real-time data will be interpreted to identify the presence of TRW in the subsurface. Potential SCAPS LIF pushes locations are depicted on Figure 4-1.

Solid soil and TRW matrix samples will be collected and analyzed for the purpose of evaluating SCAPS LIF data, and characterize variability in chemical composition of TRW for input in the CSM. A minimum of 5 percent confirmation soil samples will be collected for fixed-based laboratory analysis to corroborate SCAPS LIF data. To evaluate the SCAPS LIF effectiveness, one soil sample will be collected from the depth interval of the highest site-wide fluorescence. A second soil sample will be collected from a depth interval of background fluorescence directly above sample with the highest fluorescence. A third soil sample will be collected from an area where background fluorescence is measured through the entire push interval, (from a depth corresponding the highest fuel fluorescence at an adjacent push location). In addition, several TRW matrix samples will be collected to characterize variability in chemical composition of the TRW. Other sample locations will be selected on a judgmental basis by the DQO planning team with the goal of reducing uncertainty in the data set.

Chemicals historically associated with TRW include TPH, BTEX, PAHs, and lead. Associated pH values as low as 1.1 have also been reported in samples collected below the site. Black and gray sand observed surrounding the TRW has historically contained elevated concentrations of TPH, xylene, ethylbenzene, and PAHs.

4.2 Quality Assurance and Data Evaluation

The overall quality of tasks performed for this data gap investigation will be assured by conformance to protocols established for sample collection, analytical procedures, and data management. A summary of the quality assurance/quality control (QA/QC) protocols that will be implemented throughout the investigation is provided in detail in the SAP (Attachment A).

QA objectives and detail regarding data management, verification, and validation are also provided in the SAP. Previously collected data will be integrated with the SCAPS LIF investigation-generated data to compile a database that will be used to support risk-based decisions made for this site. Data management and database protocols are described in detail in the SAP (Attachment A).

5.0 SUMMARY OF SCAPS LIF INVESTIGATION ACTIVITIES

This section provides a list of components planned for the SCAPS LIF investigation at IR Site 13 to achieve the DQOs described in Section 4.0. The SAP (Attachment A) and Health and Safety Plan (HASP) located in Attachment B present a full discussion of sampling activities, including detail on locations, analyses, field quality control, field safety procedures, and data evaluation and validation. In summary, the following activities will be conducted during this investigation.

- 1) Project Planning
 - Preparation of Work Plan, SAP, and HASP
 - Procurement of subcontractors
 - Permitting and submittal of field initiation notice and site approval request
- 2) Field Investigation
 - Mobilize
 - Geophysical survey for utility clearance
 - Establish decontamination area to control potential site contamination
 - Advance LIF CPT pushes
 - Collect soil and groundwater samples
 - Package and ship samples to laboratory for chemical analysis
 - Global positioning system (GPS) survey of all borings locations
 - Manage and dispose liquids and solids generated during the field activities
- 3) Data Management
- 4) Data Validation
- 5) Data Evaluation
- 6) Report Preparation and submittal.

The findings, conclusions, and recommendations for further actions (if needed) pertaining to this SCAPS LIF investigation will be presented in the project report. The report will address the findings of the above work elements, and evaluate and recommend additional assessment and to support optimization of future remediation alternatives (RA) screening, if needed. The report will be prepared in general accordance with EPA (2000 and 2004) and Department of Toxic Substance Control (DTSC) (2000 and 2002) guidelines, and will generally include but not be limited to the following information:

- Site history, development, and usage;
- Site plot plan with known subsurface utilities;
- Geology and hydrogeology;
- Boring logs;
- Sampling procedures;
- Laboratory results;
- Data Quality Assessment;
- Cross-sections;
- Characterization of impact;
- Summary, conclusions and recommendations.

6.0 REFERENCES

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- United States Environmental Protection Agency (US EPA), 2004a. Region IX Preliminary Remediation Goals (PRGs). October.

TABLES

Table 4-1
Proposed Sampling Design Rationale
Alameda Point, Alameda, California

Proposed Sampling Location^(a)	SCAPS LIF Sampling and Analysis Strategy	Rationale
AP13-001 through AP13-300 (TBD)	The SCAPS LIF probe will be advanced at approximately 300 locations to a total depth of approximately 15 feet bgs.	LIF results will be compared to background data to determine if TRW contamination is present.
Proposed Sampling Location^(b)	Soil and TRW Sampling and Analysis Strategy	Rationale
Samples 1 - 5 Locations TBD	Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples. Five of the fifteen soil/TRW samples will be collected from the depth intervals of the highest site-wide fluorescence.	Analytical results will be used to evaluate the SCAPS LIF data effectiveness and further characterize TRW below the site and to evaluate whether variations in TRW composition influence LIF intensity and wavelength.
Samples 6 - 10 Locations TBD	Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples. Five of the fifteen soil/TRW samples will be collected from the depth interval of background fluorescence directly above the samples with the highest fluorescence.	Analytical results will be used to evaluate the SCAPS LIF non-detect effectiveness.
Samples 11 - 15 Locations TBD	Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples. Five of the fifteen soil/TRW samples will be collected from an area where background fluorescence is measured through the entire push interval, from a depth corresponding the highest fuel fluorescence at an adjacent push location.	Analytical results will be used to evaluate the SCAPS LIF non-detect effectiveness.

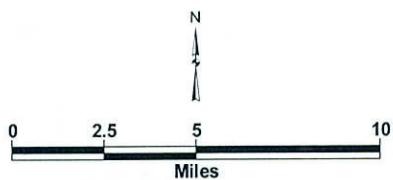
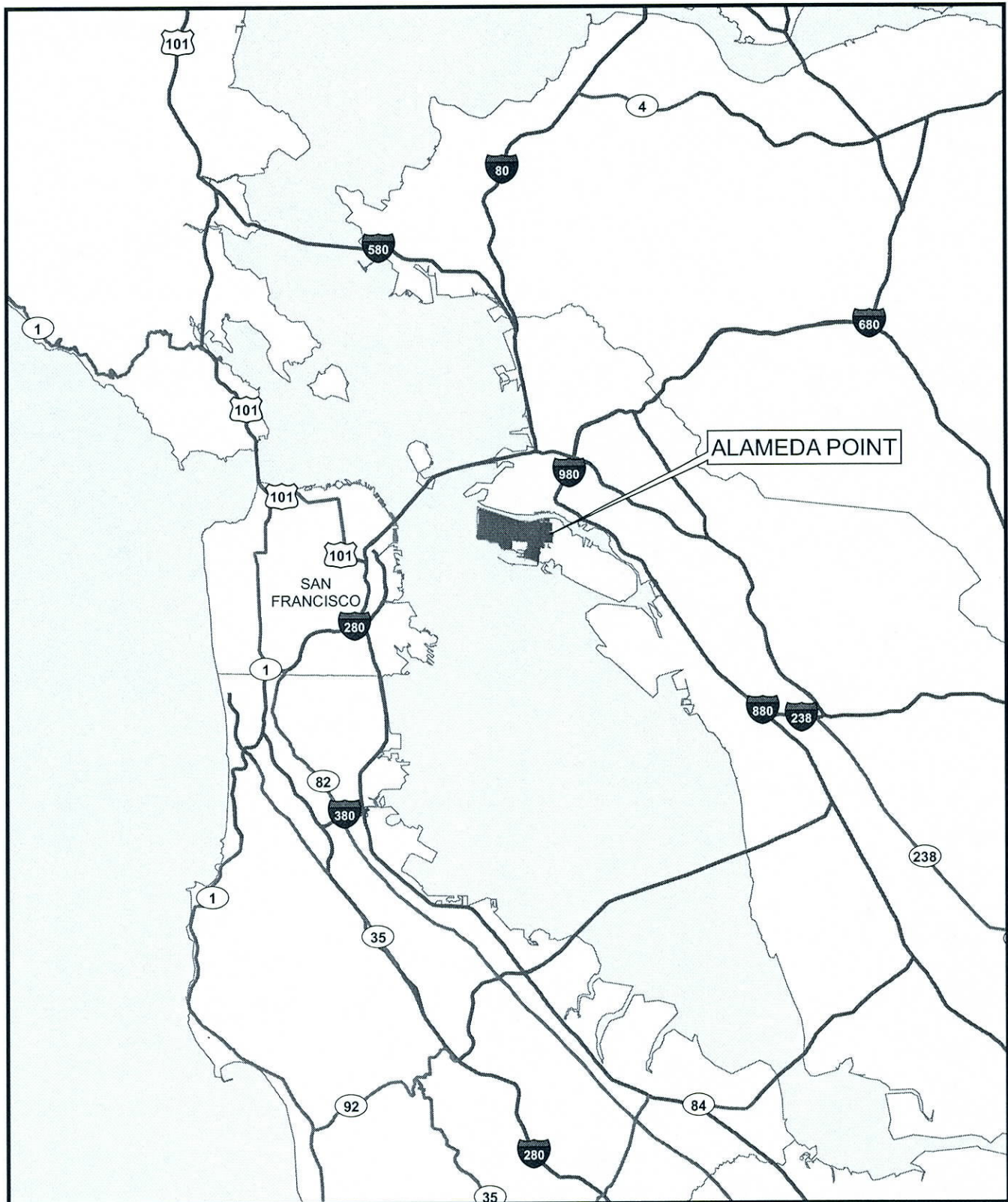
Notes:

- (a) Potential SCAPS LIF push locations are presented on Figure 3-1.
- (b) Potential soil and TRW sample locations will determined based on a review of SCAPS LIF data.

Acronyms/Abbreviations:

bgs – below ground surface
LIF – Laser-induced fluorescence
SCAPS – Site Characterization and Analysis Penetrometer System
TBD – To be determined
TRW – Tarry refinery waste

FIGURES



SITE LOCATION MAP

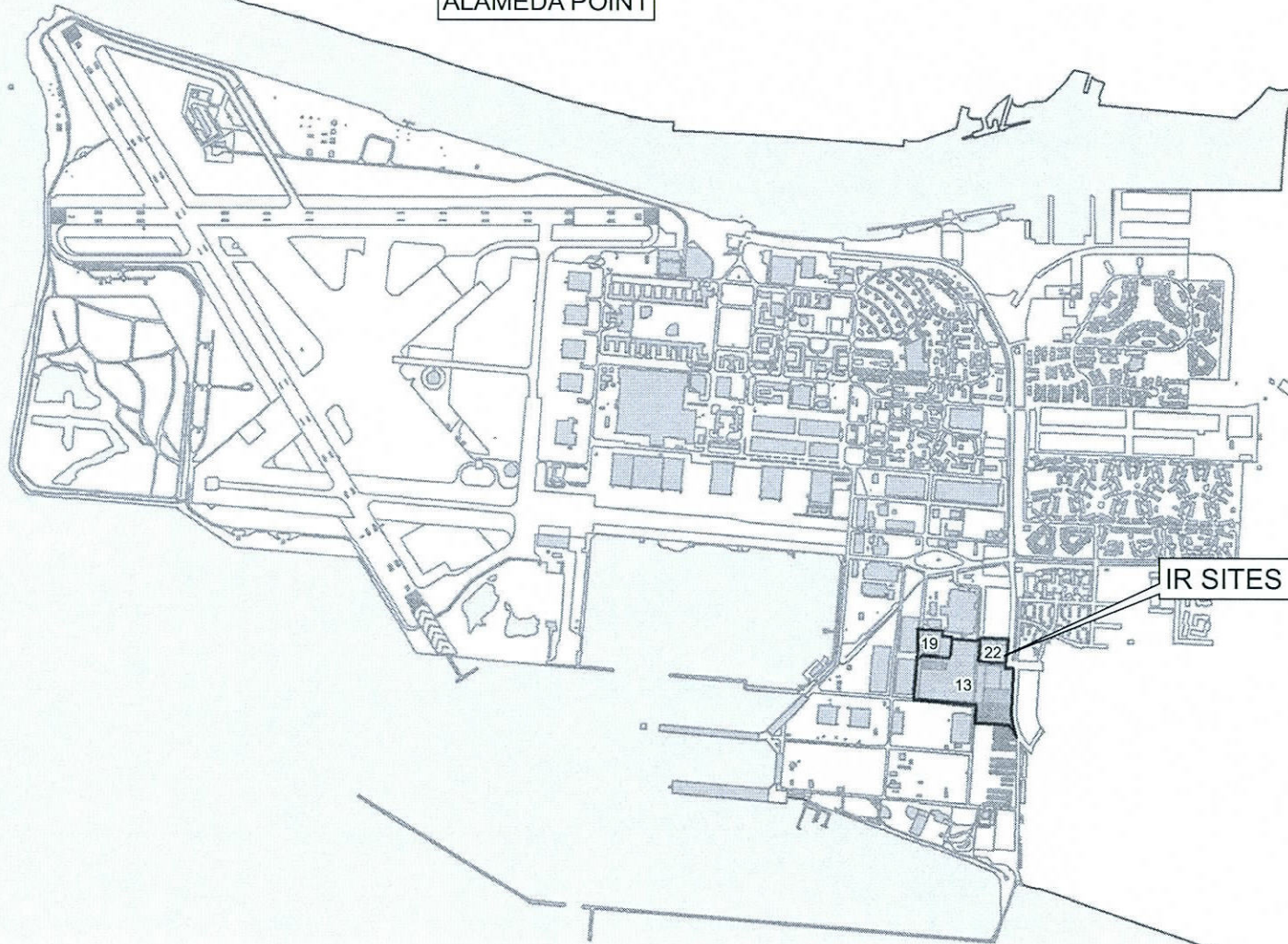
ALAMEDA POINT ALAMEDA, CALIFORNIA

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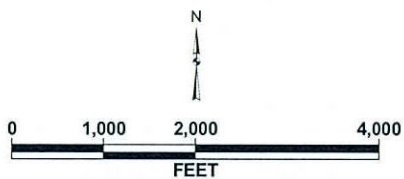
DATE: Oct 16, 2007
FILE: AlaBaseLoc

FIGURE:
1-1

ALAMEDA POINT



IR SITES 13, 19, & 22



MAP PROJECTION: NAD 27 CALIFORNIA STATE PLANE 3, SURVEY FEET

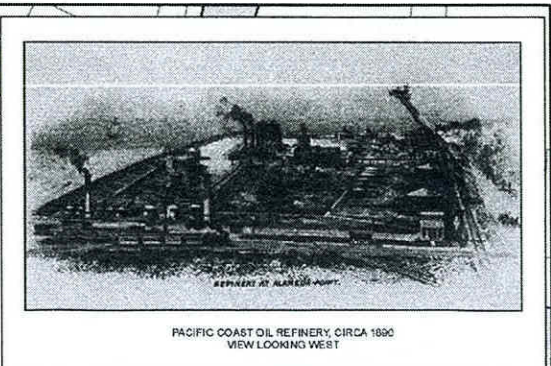
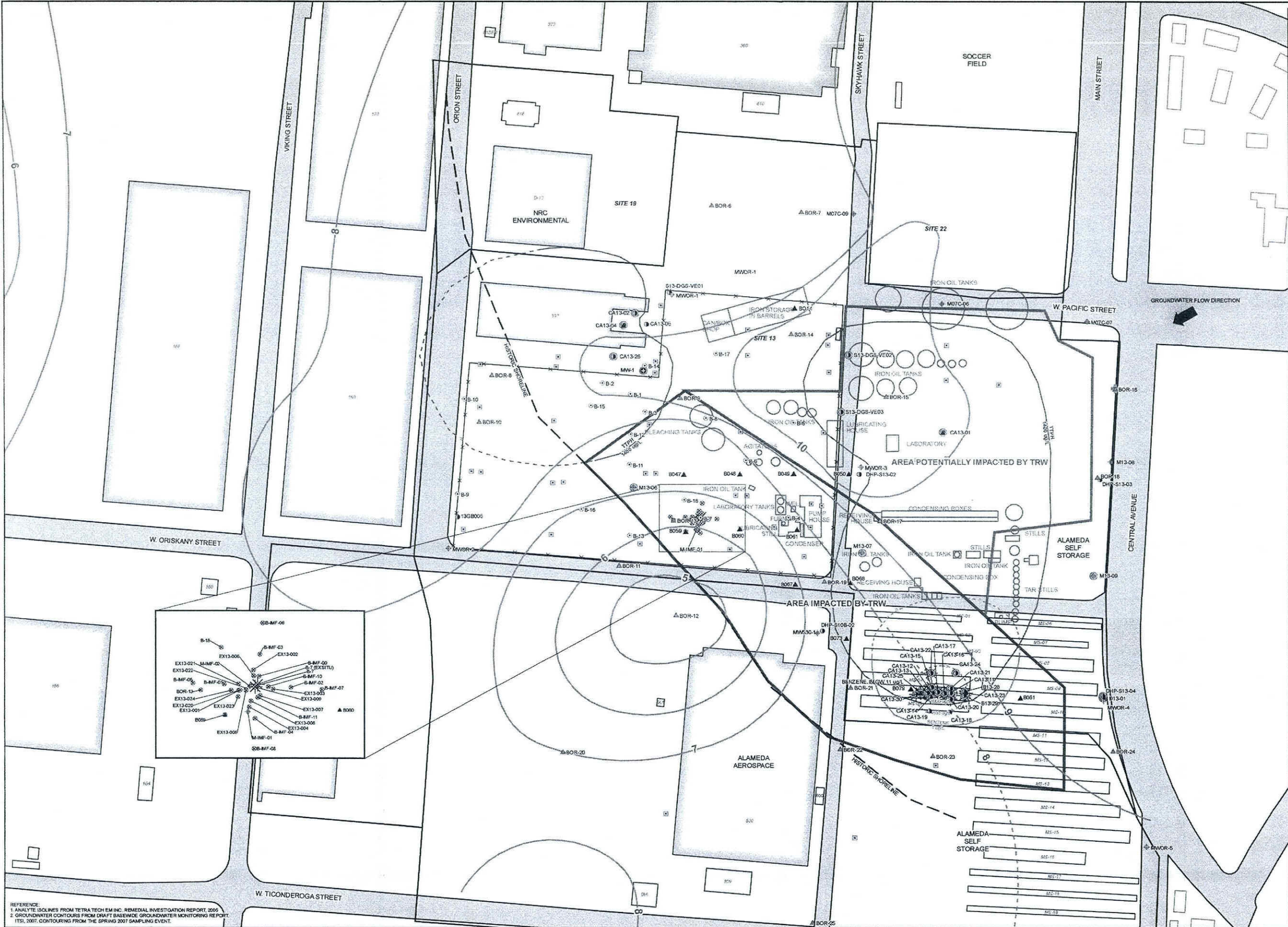
SITE PLAN

ALAMEDA POINT
ALAMEDA, CALIFORNIA

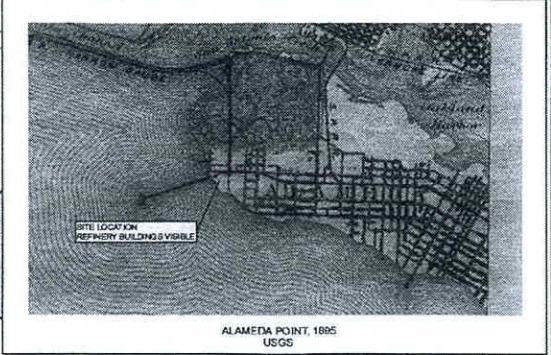
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DATE: Oct 16, 2007
FILE: AlaBaseOv

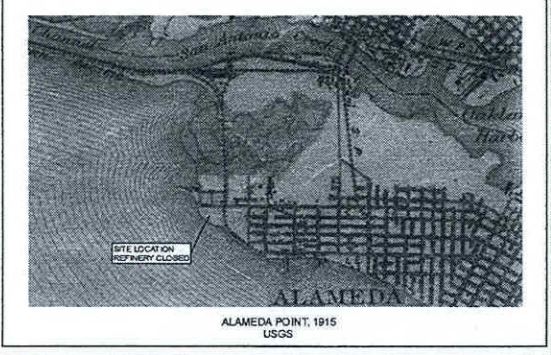
FIGURE:
1-2



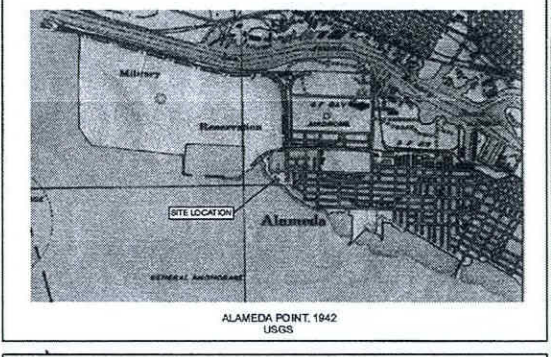
PACIFIC COAST OIL REFINERY, CIRCA 1890
VIEW LOOKING WEST



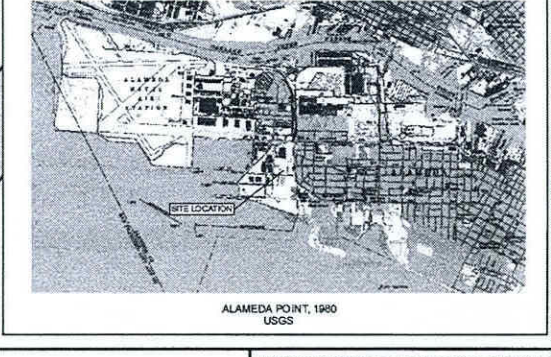
ALAMEDA POINT, 1895
USGS



ALAMEDA POINT, 1915
USGS

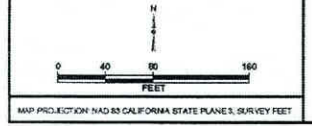


ALAMEDA POINT, 1942
USGS



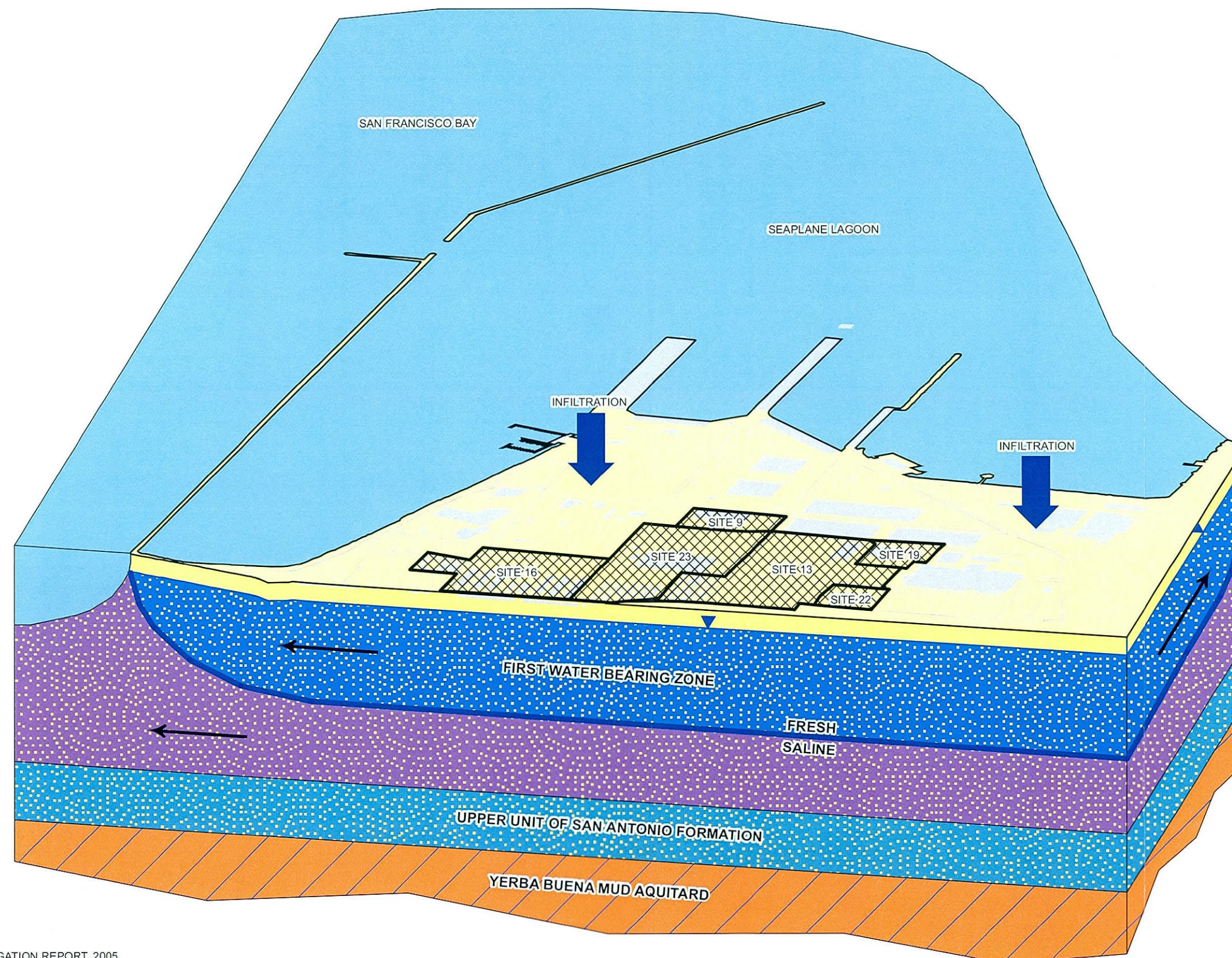
ALAMEDA POINT, 1980
USGS

REFERENCE:
1. ANALYTE ISOLINES FROM TETRA TECH EM INC. REMEDIAL INVESTIGATION REPORT, 2005
2. GROUNDWATER CONTOURS FROM DRAFT BASEWIDE GROUNDWATER MONITORING REPORT, ITS, 2007, CONTOURING FROM THE SPRING 2007 SAMPLING EVENT.



- LEGEND**
- MONITORING WELL
 - OTHER WATER SAMPLE LOCATION
 - SCAFIS INVESTIGATION (UNAD, 1994)
 - MONITORING WELL (CANON, 1981)
 - SOIL SAMPLE (CANON, 1981)
 - MONITORING WELL (PRC ENVIRONMENTAL, 1991)
 - SOIL SAMPLE (PRC ENVIRONMENTAL, 1991)
 - MONITORING WELL (HARDING LAWSON ASSOC., 1986)
 - SOIL SAMPLE (HARDING LAWSON ASSOC., 1986)
 - TPH PRC EXCEEDED
 - LEAD PRC EXCEEDED
 - BENZENE PRC EXCEEDED
 - GROUNDWATER ELEVATION CONTOUR LINE (SPRING 2007 FEET MLLW)
 - FORMER OIL REFINERY FEATURES (FROM SANBORN FIRE INSURANCE MAPS)
 - HISTORIC SHORELINE
 - TARRY REFINERY WASTE (IDENTIFIED IN SAMPLE) (DURING BASEWIDE PAV STUDY (EIGHTHS, 2003))
 - POTENTIALLY IMPACTED (BECHTEL, 2002)
 - IMPACTED (BECHTEL, 2002)

NOTES:
PRC = PRELIMINARY REMEDIATION CRITERIA
TRW = TARRY REFINERY WASTE
PAH = POLYCYCLIC AROMATIC HYDROCARBONS
DWH = GROUNDWATER
TPH = TOTAL PETROLEUM HYDROCARBONS
TPH4 = TOTAL, TOTAL PETROLEUM HYDROCARBONS
µg/L = MICROGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM
N/A = NOT DETECTED
MLLW = MEAN LOWER LOW WATER
DASHED LINE IN PLUME CONTOURS INDICATES INFERRED



REFERENCE:
TETRA TECH EM INC. REMEDIAL INVESTIGATION REPORT, 2005
NOT TO SCALE

- LEGEND**
- INSTALLATION RESTORATION SITE
 - BUILDING
 - SEAWATER
 - ARTIFICIAL FILL
 - MERRITT SAND WITH FRESH WATER
 - MERRITT SAND WITH SALINE WATER
 - UPPER UNIT OF SAN ANTONIO FORMATION
 - YERBA BUENA MUD AQUITARD

- CONTACT OF LITHOLOGIC UNITS
- ▼ FIRST WATER-BEARING ZONE WATER TABLE
- ← GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS (TDS) > 10,000 MILLIGRAMS PER LITER (mg/L))

CONCEPTUAL SITE
HYDROGEOLOGIC MODEL

ALAMEDA POINT
ALAMEDA, CALIFORNIA

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DATE: Oct 16, 2007
FILE: AlamConModel

FIGURE:
3-2



REFERENCE:
TETRA TECH EM INC. REMEDIAL INVESTIGATION REPORT, 2005

MAP PROJECTION: NAD 83 CALIFORNIA STATE PLANE 3, SURVEY FEET

LEGEND

- POTENTIAL SCAPS LOCATIONS
- TARRY REFINERY WASTE IDENTIFIED IN SAMPLE DURING BASEWIDE PAH STUDY (BECHTEL, 2003)
- TARRY REFINERY WASTE
 - POTENTIALLY IMPACTED (BECHTEL, 2003)
 - IMPACTED (BECHTEL, 2003)

NOTES:
TRW = TARRY REFINERY WASTE
TTPH = TOTAL TOTAL PETROLEUM HYDROCARBONS

POTENTIAL SCAPS LIF LOCATIONS

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FILE: PropDirPushLoc

4-1

APPENDIX A

RESPONSE TO COMMENT ON THE DRAFT WORK PLAN SCAPS LASER INDUCED FLUORESCENCE TARRY REFINERY WASTE INVESTIGATION FORMER OIL REFINERY

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

<p>General Comments of Erich Simon, Project Manager, California RWQCB, San Francisco Bay Region dated 10 August 2007</p> <p><i>Draft Work Plan</i></p>	<p>Richard Brady & Associates Responses</p>
<p>1) Aboveground Storage Tanks (ASTs) 324 through 328 – This work plan indicates that Former ASTs 324 through 328 are a potential source of petroleum products, where as the Final Projects Plans for Petroleum Corrective Actions Areas 3A, 3B, 3C, 5B West, and 13 East (May 9, 2007) indicated these tanks were not used for petroleum storage. Furthermore, these tanks will be removed from CAA 13 and any contamination present near these tanks are to be handled under the CERCLA program at IR Site 13. Please revise all discussions of ASTs 324 through 328 to reflect this change.</p>	<p>1) The Final Work Plan and Attachments for this investigation have been revised to reflect the information presented in the Final Project Plans.</p>
<p>2) High Detection Limit – While the SCAPS Laser Induced Fluorescence method is a useful tool for increasing the resolution regarding the extent of tarry refinery waste, the method's high detection limit (>100 ppm) will only delineate the highest contaminated areas. Please further discuss how the extent of any refinery waste that exists below the method detection limit will be addressed in the future.</p>	<p>2) The SCAPS Laser-Induced Fluorescence (LIF) method will be useful in mapping the extent of tarry refinery wastes (TRW) that exceed the project remediation criteria (PRCs) in soil presented in the Final Project Plans for TPH-g (1,030 mg/kg), TPH-d (1,380 mg/kg), and TPH-mo (1,900 mg/kg) under residential use. In addition, soil samples will be collected to evaluate concentrations at locations adjacent to the TRW extent as mapped by LIF. The analytical approach presented in the Data Quality Objectives (Section 3.3.5) and Table 4-1 of the Sampling and Analysis Plan (SAP) describe the soil sampling proposed for this investigation. The reporting limits for soil samples collected to define the edge of TRW are provided in Table 4-4 of the Draft</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

<p>General Comments of Erich Simon, Project Manager, California RWQCB, San Francisco Bay Region dated 10 August 2007</p> <p><i>Draft Work Plan</i></p>	<p>Richard Brady & Associates Responses</p>
	<p>Sampling and Analysis Plan and are below PRCs. The data generated from this investigation will be used to optimize remedial strategies in the Feasibility Study (FS). If this LIF investigation is unable to adequately delineate the edge of the TRW below PRCs, additional sampling may be recommended.</p>
<p>3) Extent of Contamination – Figure 4-1 shows the proposed sampling locations in relation to the area impacted by tarry refinery waste. It shows the impacted area may extend under building 530 to the south of proposed sampling locations. Please indicate what step outs will be taken if SCAPS samples taken at the edge of the site, or adjacent to Building 530, indicate that tarry refinery waste may extend beyond proposed sampling locations. Also provided some discussion of how the extent of tarry refinery waste contamination will be delineated beneath Building 530.</p>	<p>3) Figure 4-1 of the Draft Work Plan and Figure 3-1 of the Draft SAP present potential SCAPS locations in accordance with analytical approach presented in Section 3.3.5 of the Draft SAP. The word “proposed” under the legend on both figures is a typographical error. The word “proposed” in the legend on both figures has been replaced with the word “potential”. In addition, potential SCAPS locations have been added to both figures to the west of Building 530. If the real-time LIF results indicate that additional step-outs are needed, then new step-out locations will be identified in the field based on the emerging conceptual site model. No work is authorized to occur inside of Building 530 during this investigation. The edge of the TRW under the building will be interpreted by extrapolating the data outside the building.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Erich Simon, Project Manager, California RWQCB, San Francisco Bay Region dated 10 August 2007 <i>Draft Work Plan</i>	Richard Brady & Associates Responses
1) Figure 3-1 and Attachment, Figure 2-2 – Please label what contaminants are associated with the plumes presented in the figures.	1) The figures have been revised as requested in the Final Work Plan and Attachments.
2) Figure 3-2 and Attachment A, Figure 3-2 – This conceptual Site Hydrogeologic Model figure for the southern portion of Alameda Point shows that a layer of seawater within the artificial fill sits on top of the fresh water in the first water bearing zone. This thin layer of sea water in not known to exist above the first water bearing zone at these inland IR Sites. Please revise this figure to reflect the hydrogeology at these IR Sites.	2) The figures have been revised as requested in the Final Work Plan and Attachments.

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

General Comments of Anna-Marie Cook, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>1) Laser Induced Fluorescence (LIF) technology described in the Draft Work Plan, SCAPS Laser Induced Fluorescence, Tarry Refinery Waste Investigation, Former Oil Refinery (the Work Plan) appears to be a promising screening tool for the delineation of the vertical and lateral extent of tarry refinery waste (TRW). We have some concerns that the high viscosity of the TRW that may be encountered will coat and obscure the probe window, thereby producing data that is not representative of the actual contamination at the measurement depths. We are also unsure of the effect of the low pH of the TRW on any non-metal instrument parts such as O-rings. How will it be determined if the window is being obscured while the probe is being pushed into the soil and through the TRW, and is there a procedure for periodically checking the condition of the instruments?</p>	<p>1) The original SCAPS LIF system was used for an intercalibration/validation study and was utilized successfully at Former Naval Air Station Alameda (now known as Alameda Point) Installation Restoration (IR) Program Site 13 in 1994. The LIF probe proposed has not changed significantly from the LIF probe now in use on the current SCAPS platform. None of the concerns of the reviewer were encountered at that time and none of these issues are expected during this proposed SCAPS deployment at Alameda Point.</p> <p>Upon completion of each LIF push, the LIF system performance is checked by measuring and recording the fluorescence of two substances: quinine sulfate solution (strongly fluorescing substance) and Fisher sea sand (a low fluorescing substance representing uncontaminated soil). In addition, the probe is visually inspected after each push and any worn parts are replaced prior to the next push. SCAPS post push system checks are described on page 7 of Richard Brady & Associates (RBA) Standard Operating Procedure (SOP) T-005, which is included as Appendix A of the Sampling and Analysis Plan (SAP).</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarrey Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

General Comments of Anna-Marie Cook, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>2) It seems that the LIF procedures should include some site specific calibration prior to use. It is recognized that different hydrocarbon mixtures have different responses in the LIF technology, and therefore only the relative LIF responses may be useful for identifying whether the TRW (or other hydrocarbon wastes) are present. Please provide specific information on the calibration procedures that will be used to ensure that the LIF will function properly. Also, please provide procedures that will be used to identify the various spectral responses that may be encountered due to the potential presence of multiple types of hydrocarbons.</p>	<p>2) Please see response below to comment 4 of Brad Parsons, California Department of Toxic Substances Control for expanded discussion on why site-specific calibration procedures for addressing hydrocarbon (and matrix) heterogeneity are not recommended.</p> <p>The LIF system is checked before and after advancing the probe at each location. If the fluorescence intensity of the quinine sulfate system check is below acceptance criteria of 200,000 counts with a peak wavelength appropriate for the probe (typically 465 to 470 nanometers), troubleshooting and system corrective action procedures are initiated.</p> <p>The procedure used to identify various spectral responses that may be encountered is:</p> <ul style="list-style-type: none">• Inspect the real-time peak wavelength of the fluorescence for variations and groupings.• Map the distribution of the various wavelength groupings.• Use the mapped distributions when targeting sample locations for laboratory analysis.

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarrey Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

General Comments of Anna-Marie Cook, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>3) Throughout the text of the Work Plan and the Sampling and Analysis Plan (SAP) reference is made to "background" fluorescence but it is unclear how the background fluorescence will be established. Please provide information on how background fluorescence will be determined.</p>	<p>3) Background fluorescence is evaluated by comparing the fluorescence intensity of the Fisher Sea Sand systems check with the <i>in-situ</i> fluorescence intensities, and comparing <i>in-situ</i> fluorescence intensities at various depths and locations. Of particular interest are locations where no elevated fluorescence intensity is observed for the entire depth, and the fluorescence intensity is similar to the Fisher Sea Sand. Such locations define background fluorescence at the site and are good candidates for boundary soil sampling. In general, background intensity is less than 10,000 counts and elevated fluorescence is markedly greater than 10,000 counts.</p>
<p>4) Procedures for borehole abandonment have not been included in the Work Plan, SAP, or standard operating procedures (SOPs). Boreholes should be abandoned by filling them with grout. This is required in the State of California and also will minimize the potential that TRW can surface through the boreholes. Please revise the SAP and SOPs to specify that boreholes will be abandoned by filling them with grout.</p>	<p>4) SCAPS is equipped with a through the probe tip grouting system. Upon completion of a SCAPS push, the probe is withdrawn a few inches and an expendable tip is ejected using grout pump pressure. A cement and bentonite mixture is then pumped through a small diameter tube and through the tip of the probe as the probe and rod string are withdrawn from the push hole using the tremie method. A new section 4.2.5 describing SCAPS grouting has been added to the final SAP and Draft SAP sections 4.2.5, 4.2.6, and 4.2.7 are now 4.2.6, 4.2.7, and 4.2.8 in the final SAP.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

General Comments of Anna-Marie Cook, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>5) Will the LIF technology be capable of finding the 30 ft x 30 ft area filled in with concrete in the 1940's at Site 13? This information would be useful in general and also possibly helpful in evaluating remedial alternatives in the FS.</p>	<p>5) The SCAPS CPT system cannot push through concrete. If the 30 foot by 30 foot concrete pad is encountered by SCAPS, the cone pressure will rise to levels indicative of refusal and the push will be terminated. If this situation is encountered, this information will be recorded in the field logbook and presented in the LIF investigation report.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Anna-Marie Cook on the Work Plan, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>1) Section 1.2, Scope of Work, Page 2: The second bullet on this page indicates that “Soil and TRW matrix sample locations will be selected based on real-time data to evaluate SCAPS LIF effectiveness and reduce uncertainty in the data set;” it is unclear what is meant by this statement. Please clarify whether the term “effectiveness” refers to the accuracy and representativeness of the LIF data for determining the extent of the TRW and any specific constituents or provide a definition for the term as used in the Work Plan. Similarly please identify the specific uncertainties in the data sets that will be resolved. Also, please provide a list of criteria that may be applied when selecting sampling locations.</p>	<p>1) “LIF effectiveness” refers to the ability for the LIF to detect TRW in accordance with the decision rules in Step 5 of the data quality objectives (DQOs) presented in the Section 3.3.5 of the Sampling and Analysis Plan (SAP). The criteria that may be applied when selecting sampling locations are provided in Section 4.1.1, Sampling Rationale, and Table 4-1 of the SAP.</p> <p>Uncertainties in the LIF data set that may be reduced by sampling include:</p> <ul style="list-style-type: none"> • Confirmation of elevated fluorescence associated with TRW. • Confirmation of non-elevated fluorescence representative of TRW concentrations below Preliminary Remediation Criteria (PRCs) • Evaluation of the petroleum characteristics (<i>e.g.</i> gasoline vs TRW) associated with different fluorescence wavelength populations. • Other uncertainties that may emerge based on review and discussion of the real-time LIF data with regulatory partners. <p>A cross-reference to the SAP has been added to Section 1.2 of the Work Plan.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Anna-Marie Cook on the Sampling and Analysis Plan, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>2) Table 4-1, Proposed Sampling Design and Rationale, Page 15: This table indicates in the column titled "Soil and TRW Sampling and Analysis Strategies" that five of the fifteen Soil/TRW samples will be collected from the depth intervals of the highest site wide fluorescence; however it is unclear how this will be applied to selecting specific sites for sampling. It is unclear if all the LIF readings will be collected first and then sampling events will follow. Please provide the logistical and or procedural techniques that will be used to identify the sample locations with "highest fluorescence."</p>	<p>2) A meeting or conference call between the Navy and the regulatory partners is proposed near the end of the LIF portion of the field work to discuss sampling locations and strategies. Available data will be presented at this proposed meeting in accordance with the data quality objectives (DQOs) for this investigation.</p>
<p>3) Section 2.4, Previous Investigations and Section 2.5, Removal Actions: Many of the locations discussed in the text are not depicted on Figure 2-2, so it is difficult to understand the sequence of events and findings that are discussed in the text. For example, text in Section 2.4.2 describes borings B-IMF-02 through B-IMF-08, B-IMF-09 through B-IMF-11, and well M-IMF-02 that are not included on the figure. It would also be helpful to have a figure that depicts the location of known removal actions (e.g., those that occurred after 1990). Please revise Figure 2-2 to include all locations discussed in the text and provide a figure that includes the locations of the removal actions. Also, there was an additional removal action that is not mentioned</p>	<p>3) Figure 3-1 of the Final Work Plan and Figure 2-2 of the Final SAP have been revised as requested.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Anna-Marie Cook on the Sampling and Analysis Plan, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>in the text. In 2003, the Navy installed a fence around the perimeter of Site 13 as an engineering control to restrict access to the site.</p>	
<p>4) Section 3.3.2, Step 2: Identify Goals of the Study, Pages 20 and 21: Another question is needed to cover the objective discussed in Section 4.1 of the Work Plan. The second paragraph on page 11 states that "several TRW matrix samples will be collected to characterize variability in chemical composition of the TRW." Please include a question to cover this objective.</p>	<p>4) An additional question has been added to Section 3.3.2 of the Final SAP that states: <i>"What is the chemical variability of the TRW?"</i></p>
<p>5) Section 3.3.4, Step 5: Analytical Approach, Pages 21 and 22: It is unclear why Total Petroleum Hydrocarbons (TPH)-diesel and TPH-motor oil are the only hydrocarbons specifically identified in the Data Quality Objectives (DQO) Step 5, items 4 through 6, when benzene, toluene, ethylbenzene, xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs) have also been associated with TRW. It is likely that naphthalene is also present. Please revise DQO Step 5, items 4 through 6 to include criteria for BTEX and PAHs. Please also include naphthalene as a constituent of concern.</p>	<p>5) The requested information has been included in Section 3.3.5 of the Final SAP.</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarrry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Anna-Marie Cook on the Sampling and Analysis Plan, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>6) Section 3.3.4, Step 5: Analytical Approach, Page 22: Item 7 indicates that field teams may eliminate proposed locations as appropriate but no information or criteria are provided to clarify how the field team will decide that sample locations are unnecessary. Please provide rationale and/or criteria that may be applied for the reduction of sample locations.</p>	<p>6) The number of LIF pushes may be reduced during the LIF investigation. The following statement has been added to Section 3.3.4 of the Final SAP: <i>"If two consecutive LIF pushes of background fluorescence are recorded throughout the entire length of the push in a direction away from the TRW mass , then the edge of the TRW will be considered delineated."</i></p> <p>Soil samples will be collected to confirm the edge of the TRW has been delineated.</p>
<p>7) Section 4.1.1, Sampling Rationale, Page 24: The basis for assumptions made in this section has not been included. For example, the third paragraph indicates that there is an expectation that surface LIF readings will be background. This section also assumes that contamination will exist at thicknesses greater than 1.5 feet. Both of these assumptions need to be explained, as TRW contamination has been observed as "oozes" at the surface. TRW may be present in thinner lenses or as globules and ganglia, possibly from multiple releases of contamination or subsequent flow as a viscous liquid. Please revise this paragraph to explain the assumption that readings at the surface will be background and the contamination is expected to occur in thicknesses of 18 inches. Such assumptions may bias the interpretation of the LIF information and ignore less contaminated areas of the site that</p>	<p>7) In order to have the opportunity to receive input from regulatory partners regarding the final SCAPS sample strategy based on the LIF data, a meeting or conference call between the Navy and the regulatory partners is proposed near the end of the LIF portion of the field work to discuss sampling locations and strategies. Available data will be presented at this proposed meeting in accordance with the data quality objectives (DQOs) for this investigation.</p> <p>Regarding the assumption that "surface LIF readings will be background": If elevated fluorescence (greater than background) is detected from ground surface to the depth of highest fluorescence at a location, then a sample representing background fluorescence above the interval of highest fluorescence cannot be</p>

Response to Comments
Draft Work Plan, SCAPS Laser Induced Fluorescence Tarry Refinery Waste Investigation,
Former Oil Refinery, Alameda Point, Alameda, California.

Specific Comments of Anna-Marie Cook on the Sampling and Analysis Plan, Remedial Project Manager, U.S. Environmental Protection Agency Region IX, dated 06 September 2007	Richard Brady & Associates Responses
<p>may require remediation.</p> <p>The text in Section 4.1 of the Work Plan states that samples will be collected from a minimum of five percent of the LIF locations, and it appears that - depending on the objectives of the study - more samples will be required. For example, if only correlation of the LIF data with constituents in the TRW is of interest (presuming TRW produces the highest LIF responses), then the five percent sampling strategy may be acceptable. However, if intermediate LIF responses are observed, these locations also could be sampled to better correlate the LIF responses with the different types/sources of contamination. More sampling to better characterize the site based on the use of SCAPS-LIF would be useful for eventual remediation decisions. Please provide some criteria for conducting soil sampling and analyses to best characterize the site, using more than the five percent criteria if necessary.</p>	<p>collected. In that case, the field team will propose an alternate sample location in a field change notice and during the sample strategy discussion proposed before the sampling event. Section 4.1.1 and Table 4-1 "Proposed Sampling Design Rationale" have been revised to include this decision path.</p> <p>Regarding the noted assumption that "contamination will exist at thicknesses great than 1.5 feet": Section 4.1.1 states that the field team will propose sampling from an interval of fluorescence that "ideally is more than 18 inches thick." The goal of this statement is to ensure as much as possible that the <i>ex-situ</i> samples sent to the analytical laboratory will be representative by targeting an interval most likely to have consistent, homogenous contaminant distribution that can be represented by a subsample collected from a standard six-inch-long drive sample tube. If upon review of the LIF data, this goal can be accomplished better by targeting an interval that is less than the "ideal" 18 inch thickness, the language as currently written allows the field team to target a thinner interval.</p> <p>However, very thin heterogeneous intervals, such as globules and ganglia, are much more difficult (and usually technically infeasible) to sample for the purpose of comparing to <i>in-situ</i> LIF. Factors causing this difficulty include the following:</p>

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	<ul style="list-style-type: none">• Potential incomplete <i>ex-situ</i> sample recovery and the associated loss of depth control, causing uncertainty in the correlation with the LIF measurement depth,• The laboratory's standard subsampling procedure of drive sample tubes does not control the effect of heterogeneous distribution of globules or ganglia within the sample tube. Different subsamples of heterogeneous matrices within the same tube will produce a different concentration results depending on whether or not a globule or portion of a ganglia was captured in the subsample. <p>In areas of thin heterogeneous impact, the LIF data alone may provide best description of the TRW distribution, therefore sampling of very thin fluorescence intervals is not recommended.</p> <p>The primary use of laboratory data in this investigation is to evaluate whether or not SCAPS-LIF data is useful in evaluating the extent of TRW. The secondary use of the laboratory data is to provide data on the chemical nature of the TRW. To address the primary use, ten samples are planned to evaluate the concentration of TRW and key TRW constituents in areas where the SCAPS-LIF does not show elevated fluorescence, <i>i.e.</i>, just outside of the boundary of TRW extent as determined by LIF. To address the secondary use, five samples are planned to target</p>

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	<p>areas with high fluorescence.</p> <p>The total number of samples proposed is based on a scope of work designed to optimize project resources by focusing on the use of field methods capable of generating rapid near-continuous vertical measurements to evaluate TRW extent. The results of this investigation may lead to recommendations for additional sampling to assess the feasibility of eventual remediation options.</p>
<p>8) Section 4.2.5, Decontamination Procedures, Page 26 and Appendix A, SOP RBA T-01: The decontamination procedures may not be sufficient to remove TRW from the SCAPS assembly and probe, or from non-disposable sampling equipment. It may be necessary to use diesel fuel or a suitable solvent to remove TRW.</p>	<p>8) The SCAPS LIF study in 1994, using a similar decontamination system, did not have any issues related to removing TRW from subsurface investigative tools. It is not anticipated that the current system will have any difficulty removing TRW from subsurface investigative tools.</p>
<p>9) Figure 2-2, Previous Analytical Results: Please include the location of the previous LIF investigation.</p>	<p>9) Figure 3-1 of the Final Work Plan and Figure 2-2 of the Final SAP have been revised as requested.</p>
<p>10) Figure 3-1, Potential SCAPS LIF Locations: Please provide a description of the systematic grid spacing of the sample locations.</p> <p>Also, it appears that the sample spacing around the north and south side of building 397 may need to be denser if the data proximal to this building suggest there may be TRW in this area.</p>	<p>10) The 50-foot grid pattern was developed by the DQO planning team to adequately address the goals of the study as outlined in the Data Quality objectives.</p> <p>The SCAPS LIF investigation will incorporate additional LIF push locations if denser data is required around Building 397.</p>

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Comments of Brad Parsons, Senior Environmental Scientist, Site Mitigation – Cleanup Operations, California Department of Toxic Substances Control, dated 10 September 2007	Richard Brady & Associates Responses
<p>1) Will the SCAPS Laser Induced Fluorescence (SCAPS-LIF) technique work successfully on a tarry matrix? DTSC is concerned that the tar will adhere to the window between the LASER and the soil. If the tar smears on the window, readings may occur that do not accurately reflect soil properties and contamination.</p>	<p>1) The original SCAPS LIF system was used for an intercalibration/validation study was utilized successfully at Former Naval Air Station Alameda (now known as Alameda Point) Installation Restoration (IR) Program Site 13 in 1994. The LIF probe proposed has not changed significantly from the LIF probe now in use on the current SCAPS platform. None of the concerns of the reviewer were encountered at that time and none of these issues are expected during this proposed SCAPS deployment at Alameda Point.</p>
<p>2) It is not clear how background fluorescence is established. It almost appears as if background is established with each push, using the prior reading prior to a significant increase in fluorescence. Nonetheless, specific concentrations are being used in point 5 of Section 3.3.5 (Data Quality Objectives), that is 1,380 miligrams per kilogram (mg/kg) for total petroleum hydrocarbons as diesel (TPH-d), and 1,900 mg/kg for total petroleum hydrocarbons as motor oil (TPH-mo). Perhaps a range of values could be used, rather than a brightline concentration. For example, if the readings are below 1000, the soil could be considered clean, above 2,000 and it would be considered contaminated, and between 1,000 and 2,000, it would be uncertain. After review of all the data and laboratory analysis, areas of uncertainty could be defined.</p>	<p>2) The brightline values represent the Preliminary Remediation Criteria (PRCs) included in the TPH strategy for Alameda Point. The TPH Strategy and associated PRCs have been previously agreed to by the Navy and regulatory partners. This investigation attempts to work within that established framework.</p> <p>Historical SCAPS operations at a wide variety of sites over a period of more than ten years have showed that SCAPS-LIF can be expected to have a detection threshold in the low hundreds of parts per million. The specific PRC concentrations in the DQOs are higher than the expected SCAPS-LIF detection threshold. If the planned soil samples corroborate the expected detection threshold, then the extent of TRW as determined by LIF would be a conservative estimate, with the boundary representing concentrations lower than the PRCs. However, due to the viscous nature of the TRW, the concentration gradient at the edge of the contaminant mass is likely to be quite steep, and the</p>

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	boundary determined by LIF may be adequate for evaluating remediation options.
<p>3) Section 3.3.6, Performance of Acceptance Criteria, does not seem to contain measurable rates of decision errors. For example, what percent of false negatives or false positives are acceptable?</p>	<p>3) As framed in the DQOs, the primary decision questions for this investigation relate to the extent of the TRW contamination. The potential decision errors as qualitatively analyzed in Table 3-1, are:</p> <ul style="list-style-type: none"> • Concluding that TRW is present at a location when it is not present (false positive), • Concluding that TRW is not present at a location when it is present (false negative). <p>The qualitative analysis basically says that these potential decision errors across the site will be controlled by drastically increasing measurement density by using SCAPS-LIF technology, so that hot spots and substantial clean areas will not be missed in the sampling pattern.</p> <p>The approach taken did not, however, address potential apparent false positive and false negatives due solely to conflicting data between SCAPS-LIF technology and laboratory analysis of samples. This is because the project remediation criteria concentrations are well above the typical detection threshold of the LIF system (see answer to question 2 above), and substantial conflicts between the SCAPS-LIF data and laboratory analysis of samples are not expected. If substantial conflicts between the two</p>

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	data streams occur, then the potential for the effects of site heterogeneity will be evaluated, and if appropriate, recommendations given for additional sampling or limitations for the use of SCAPS-LIF data.
<p>4) Instrument calibration appears to be at the beginning of each push, according to the SCAPS-LIF Standard Operating Procedures. It would seem prudent to calibrate at the end of the push, prior to cleaning the window. Also, the Certification from DTSC recommends calibration using various lithologic soil types found at the site. Has this been inadvertently left out of the SOP, or has another approach been found subsequent to the DTSC certification process that works better?</p>	<p>4) Both before and after each LIF push, the LIF system performance is checked by introducing the laser to a quinine sulfate solution and Fisher sea sand. The resultant ultraviolet light is recorded by the detector to assess system performance. In addition, the probe is visually inspected after each push and any worn parts are replaced prior to the next push. SCAPS post-push system checks are described on page 7 of Richard Brady & Associates (RBA) Standard Operating Procedure (SOP) T-005 which is included as Appendix A of the Sampling and Analysis Plan (SAP).</p> <p>The 1996 DTSC Certification contained a statement that appropriately limited the usefulness of predeployment calibration: “Site Detection Limits and Fluorescent Thresholds determined through predeployment calibration procedures may not be representative of all matrices and contaminants encountered at a given site.” Since the DTSC Certification, experience has shown that it was misleading to attempt to establish numeric limits and thresholds in an attempt to link <i>in-situ</i> fluorescence counts to concentrations. Benchtop predeployment calibration procedures are generally not recommended for the following reasons:</p>

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	<ul style="list-style-type: none">• Sites are sufficiently heterogeneous in the mixtures of soil types and fuel products with various degrees of weathering to prevent representative benchtop simulation.• Separate-phase petroleum product migration in the subsurface is typically bounded by a relatively steep concentration gradient that, despite the specific matrix and contaminant heterogeneities, rapidly drops below concentrations of regulatory interest (in terms of “soil contamination”) over a relatively short distance.• SCAPS-LIF, with a nominal detection threshold in the low hundreds of parts per million, is essentially a tool for investigating separate phase petroleum hydrocarbon product, and generally can map the edge of the product well enough to successfully target boundary confirmation soil sample locations. <p>The approach that is currently used is to use three-dimensional mapping of fluorescence distributions to optimize limited sampling locations for laboratory analysis, taking into account cone penetrometer soil classification data where appropriate.</p>

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General Comments and Recommendations of Michelle Dalrymple, Engineering Geologist, Geologic Services Unit, California Department of Toxic Substances Control, dated 06 September 2007	Richard Brady & Associates Responses
<p>A) GSU requests that a discussion of potential matrix effects and spectral interferences that may occur during the investigation be included in the DWP. Please also discuss the possible effects of small scale heterogeneities on confirmation sample results. Please clarify the extent to which the presence of commingled petroleum hydrocarbons from other sources (such as the ASTs and near Building 397) may confound the interpretation of the SCAPS LIF results for the TRW investigation. Please also clarify the extent to which the presence of the Marsh Crust, if encountered, may interfere with the interpretation of the SCAPS LIF results for the TRW investigation (see Specific Comment 1c).</p>	<p>A) Previous SCAPS LIF investigations at Alameda Point have provided valuable spectral data on the differing petroleum related constituents in the OU-2A area. It is anticipated that the TRW will fluoresce at different wavelengths than other petroleum compounds known to occur at OU-2A.</p> <p>The occurrence of Marsh Crust is not expected over the majority of the LIF investigation area as depicted on Figure 4-1 of the Work Plan and Figure 3-1 of the SAP. However, Marsh Crust may exist in the southwest corner of the investigation area where the BSU is present. It is anticipated that the Marsh Crust Unit will fluoresce with different spectral properties than the TRW. A subset of confirmation samples will be necessary if the spectral properties are similar between Marsh Crust and TRW.</p>

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Specific Comments and Recommendations of Michelle Dalrymple, Engineering Geologist, Geologic Services Unit, California Department of Toxic Substances Control, dated 06 September 2007	Richard Brady & Associates Responses
<p>1) <u>Section 3.4 – Conceptual Site Model.</u></p> <p>a) The second to last paragraph in this section references the Navy Public Works Center report dated 1997 for the groundwater flow direction information. Figure 3-1, which shows groundwater elevation contours, references the Tetra Tech EM Inc. Remedial Investigation (RI) Report dated 2005, but the date of the groundwater elevation information is not indicated on the figure. GSU requests that that the most recent available groundwater data be used to evaluate groundwater elevations and flow directions, and that this information is referenced accordingly in the DWP. Also, GSU requests that the date of the groundwater elevation measurements shown on figures be provided.</p> <p>b) One sample with visual identification of TRW appears to be missing from Figure 3-1. A sample from boring B014 located on the eastern side of the “Iron Storage in Barrels” feature, approximately 120 feet from the southwest corner of IR Site 22, was identified as containing TRW as shown on Figure 6-12 of the Tetra Tech EMI Inc. RI Report (2005). Please clarify why this sample location is not shown or add this information to Figure 3-1.</p>	<p>1)</p> <p>a) The second to last paragraph of Section 3.4 and Figure 3-1 of the Final Work Plan has been revised to reflect the most current available groundwater elevation data from the Spring 2007 Basewide Groundwater Monitoring event.</p> <p>b) The approximate location of boring B014 has been added to Figure 3-1 of the Final Work Plan.</p> <p>c) The second to last paragraph of Section 3.4 of the Final Work Plan has been revised to include the requested information. The occurrence of Marsh Crust is not expected over the majority of the LIF investigation area as depicted on Figure 4-1 of the Work Plan and Figure 3-1 of the SAP. However, Marsh Crust may exist in the southwest corner of the investigation area where the BSU is present. It is anticipated that the Marsh Crust will fluoresce with different spectral properties than the TRW. A subset of confirmation samples will be necessary if the spectral properties are similar between Marsh Crust and TRW.</p> <p>d) The requested information has been added to Figure 3-2 of the Final Work Plan.</p>

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<p>c) The conceptual site model (CSM) presented in the work plan should discuss the occurrence and thickness of the Bay Sediment Unit (BSU) and Marsh Crust in the investigation area. GSU questions whether the petroleum contamination associated with the Marsh Crust may potentially interfere with the results of the SCAPS LIF investigation for the TRW contamination. Please discuss the occurrence of the BSU and Marsh Crust in the investigation area and refine the conceptual site model, as appropriate.</p> <p>d) Please identify the Artificial Fill, BSU, and Merritt Sand on Figure 3-2.</p>	
<p>2) <u>Section 4.1 – Sampling Locations, Analyses, and Rationale.</u> Figure 4-1 shows only one of the three hydrocarbon plumes that are present in the study area (see DWP Figure 3-1). Please include all three plumes on Figure 4-1. Please also note that there is no reference to Figure 4-1 in the DWP, and include a reference to this figure.</p>	<p>2) The requested information has been added to Figure 4-1 of the Final Work Plan. An additional sentence has been added to the end of the second paragraph of Section 4.1 of the Final Work Plan that states: <i>“Potential SCAPS LIF pushes locations are depicted on Figure 4-1.”</i></p>
<p>3) <u>Attachment A, Section 3.3.2 – Step 2: Identify Goals of the Study.</u> It is stated that the primary investigation question is to define the extent of TRW. This section should clarify that another important investigation question is to characterize the chemical nature of the TRW.</p>	<p>3) An additional question has been added to Section 3.3.2 of the Final SAP that states: <i>“What is the chemical variability of the TRW?”</i></p>

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<p>4) <u>Attachment A, Section 4.1.1 – Sampling Rationale.</u></p> <p>a) The DWP specifies that soil samples and/or TRW matrix samples will be collected at five percent of the SCAPS LIF locations to confirm the effectiveness of the SCAPS LIF technology and to characterize the TRW. According to Table 4-1, five percent means that 15 of the 300 LIF locations will be selected for confirmation sampling, and one sample from each confirmation boring will be analyzed (for a total of 15 samples). GSU questions whether it would be prudent to collect more than one sample from at least some of the confirmation borings. Please clarify whether the Navy intends to collect more than one sample per confirmation boring at some locations and the rationale. Please also clarify how it was determined that five percent would be a sufficient number of confirmation samples for this investigation.</p> <p>b) GSU requests that the Navy consider collecting confirmation soil samples from locations exhibiting high, medium, and low fluorescence, as well as from locations exhibiting background fluorescence.</p> <p>c) Table 4-1 does not identify “analytical approaches 4, 5, and 6” referenced in this section. Please clarify the meaning of analytical approaches 4, 5, and 6.</p>	<p>4)</p> <p>a) A meeting or conference call between the Navy and the regulatory partners is proposed near the end of the LIF portion of the field work to discuss sampling locations and strategies. Available data will be presented at this proposed meeting in accordance with the data quality objectives (DQOs) for this investigation. The investigation is not bound to one soil sample per SCAPS soil sample push location. Five percent soil sampling was estimated to be sufficient for the goals of this investigation. If at the end of the LIF investigation, additional samples are appropriate, future sampling will be recommended.</p> <p>b) A meeting or conference call between the Navy and the regulatory partners is proposed near the end of the LIF portion of the field work to discuss sampling locations and strategies. Available data will be presented at this proposed meeting in accordance with the data quality objectives (DQOs) for this investigation.</p> <p>c) Analytical Approach is the new term for Step 5 of the DQO process (USEPA 2006). Step 5 was formerly called “Decision Rules” under the former EPA DQO guidance. The Analytical Approach is presented in Section 3.3.5 of the SAP.</p>

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<p>5) <u>Attachment A, Section 4.2.4 – SCAPS Investigation.</u> All CPT boreholes must be grouted to minimize the potential for the borehole to act as a conduit for contaminant migration. This section should provide the grouting procedures and materials that will be used to backfill CPT boreholes.</p>	<p>5) SCAPS is equipped with a through the probe tip grouting system. Upon completion of a SCAPS push, the probe is withdrawn a few inches and an expendable tip is ejected using grout pump pressure. A cement and bentonite mixture is then pumped through a small diameter tube and through the tip of the probe as the probe and rod string are withdrawn from the push hole using the tremie method. A new section 4.2.5 describing SCAPS grouting has been added to the final SAP and Draft SAP sections 4.2.5, 4.2.6, and 4.2.7 are now 4.2.6, 4.2.7, and 4.2.8 in the final SAP.</p>
<p>6) <u>Attachment A, Section 4.2.4.3 – Soil Sampling Methods.</u> A reference to the soil sampling Standard Operating Procedures (SOPs) in Appendix A should be added to this section.</p>	<p>6) The following sentence has been added to the end of Section 4.2.4.3: <i>“Soil and TRW matrix samples will be collected in accordance with the SOPs RBA T-004 and T-006 (Appendix A).”</i></p>
<p>7) <u>Attachment A, Section 4.3.1.1 – LIF.</u> Please include a discussion of the type and frequency of SCAPS LIF system calibration that will be performed (i.e., initial, daily, before and after each push), and the type and frequency of system inspection and maintenance activities that will be performed (such as inspection of the system components to look for signs of</p>	<p>7) Upon completion of each LIF push, the LIF system performance is checked by introducing the laser to a quinine sulfate solution and Fisher sea sand. The resultant ultraviolet light is recorded by the detector to assess system performance. In addition, the probe is visually inspected after each push and any worn parts are replaced prior to the next push. SCAPS post-push</p>

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deterioration as a result of extremely low pH).	system checks are described on page 7 of Richard Brady & Associates (RBA) Standard Operating Procedure (SOP) T-005, which is included as Appendix A of the Sampling and Analysis Plan (SAP).
8) <u>Attachment A, Appendix A</u> . It is unclear why the Sampling and Analysis Plan contains a SOP for low-flow purging and sampling of groundwater monitoring wells since groundwater sampling is not included in the scope of this effort. Please clarify or remove the groundwater sampling SOP.	8) SOP RBA T-002 has been removed from the Final Attachment A, Appendix A.

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General Comments of Nannette Oseas, Senior Industrial Hygienist, Human and Ecological Risk Division, Industrial Hygiene and Safety Branch, California Department of Toxic Substances Control, dated 29 August 2007	Richard Brady & Associates Responses
<p>1) The Department of Toxic Substances Control (DTSC) reviewed the Health and Safety Plan, Emergency Action Plan and Spill Response and Reporting Requirements for compliance with Title 8, California Code of Regulations (T8 CCR), DTSC's policies and guidelines, and the NIOSH/OSHA/USCG/EPA Guidance Manual as well as other appropriate State and Federal Health and Safety Regulations. The review of the health and safety plan is not a guarantee that it will be properly and safely implemented; implementation is the employer's responsibility.</p> <p>The DTSC is unable to foresee all the health and safety hazards in the work-place by the review of the submitted plan. Continuous surveillance of the work-site and creation of an effective health and safety program by the employer will reduce work place injuries and reduce liability.</p> <p>An industrial hygienist from the IHSB may perform a field audit in order to confirm the implementation of the HASP. The review of this HASP is not a guarantee that it will be properly and safely implemented. HASP implementation is the employer's responsibility.</p>	<p>1) The Navy appreciates DTSC's comments on the Draft Health and Safety Plan (HASP). The Navy agrees that a properly implemented safety plan is the employer's responsibility.</p> <p>The Health and Safety Plan (HASP) provided with the Draft Work Plan and Attachments has been reviewed by the Naval Environmental Health Center (NEHC) in accordance with Naval Facilities Engineering Command Southwest (NAVFAC SW) and Base Realignment and Closure Program Management Office (BRAC PMO) West contractual requirements. NEHC comments have been incorporated in the Draft version of the HASP. The main guidance documents used by Department of Defense (DOD) Contractors on federally owned DOD facilities are the U.S. Army Corps of Engineers Safety and Health Manual EM 385-1-1, the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations Parts 1910 and 1926, U.S. Environmental Protection Agency (EPA) Standard Operating Safety Guides, and the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.</p> <p>NAVFAC SW, BRAC PMO West, and OSHA reserve the right to perform field safety audits on the proposed field work.</p>

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General Comments of Nannette Oseas, Senior Industrial Hygienist, Human and Ecological Risk Division, Industrial Hygiene and Safety Branch, California Department of Toxic Substances Control, dated 29 August 2007	Richard Brady & Associates Responses
<p>In several sections of the HASP, Federal Occupational Safety and Health Administration (Fed-OSHA) regulations are referenced. Fed-OSHA is the overall governing body for occupational safety and health, when a state approved program does not exist. However, in the State of California, there is a state approved OSHA plan. Cal-OSHA standards should be referenced and followed, unless all work activities will be carried out by federal workers.</p> <p>Please note that all sub-contractors must submit their own health and safety plans to the DTSC for review. The documents were reviewed for scientific content. Minor grammatical or typographical errors that do not affect interpretation have not been noted; however, these should be corrected in future versions of the documents.</p>	<p>All work is proposed to be performed by Federal Contractors on Federally owned DOD facilities. No field subcontractors are proposed for this investigation.</p>

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Specific Comments of Nannette Oseas, Senior Industrial Hygienist, Human and Ecological Risk Division, Industrial Hygiene and Safety Branch, California Department of Toxic Substances Control, dated 29 August 2007	Richard Brady & Associates Responses
<p>1) Section 4.2.2, Industrial Hazards. Please provide specific information on the distance that must be kept from overhead power lines.</p>	<p>1) Drilling equipment will not operate within 15 feet of an overhead power line.</p>
<p>2) Section 6.1, Organic Vapors.</p> <p>A. It is understood that air monitoring has been done at other naval sites; unless the sites and site conditions are the same, and the data is provided, then air monitoring must be conducted at this site. Please include in the plan the instruments, frequency and action levels for organic vapor air monitoring.</p> <p>B. The plan states, "All breathing zone samples with a sustained reading exceeding action levels presented ... and lasting at least 5 minutes in duration shall be evaluated." Please provide information relating to stop work levels.</p> <p>C. The plan states, "If TVA levels indicate sustained levels greater than 25-ppm organic vapors, indirect air monitoring shall be considered." What is "indirect air monitoring"?</p>	<p>2) Air monitoring will be performed in accordance with the HASP, Sections 6-0 through 6.3.</p>
<p>3) Table 1, Activity Hazard Analysis. Please provide an activity hazard analysis specific to the work activities at this site.</p>	<p>3) The Activity Hazard Analysis is provided in Table 1.</p>

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Conclusions and Recommendations of Nannette Oseas, Senior Industrial Hygienist, Human and Ecological Risk Division, Industrial Hygiene and Safety Branch, California Department of Toxic Substances Control, dated 29 August 2007	Richard Brady & Associates Responses
<p>In utilizing the Health and Safety Plan, field staff must be able to obtain sufficient information to compile an accurate assessment of the site safety issues associated with every job function. The submitted document requires additional information and/or clarification of the issues identified above; the areas where the IHSB has requested additional information and/or clarification must be corrected or clarified and resubmitted for further review.</p> <p>Final revisions must be incorporated into the document in a comprehensive format which allows site workers to readily access information within the document. The final Health and Safety Plan must be available at all times for on-site personnel to reference.</p>	<p>Comment noted. Please see responses to general and specific comments above.</p> <p>A copy of the Final Health and Safety Plan will be available at all times to site workers.</p>

ATTACHMENT A

DEPARTMENT OF THE NAVY – NAVFAC SOUTHWEST
Naval Facilities Engineering Command
1220 Pacific Highway, San Diego, California 92132-5190



**FINAL
SAMPLING AND ANALYSIS PLAN
FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN
SCAPS LASER INDUCED FLUORESCENCE
TARRY REFINERY WASTE INVESTIGATION
FORMER OIL REFINERY
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

Contract Number: N68711-03-D-4302

**Task Order: 237018
NAVFAC SW CTO 0066**

DCN: RBAE.4302.7018.0011

OCTOBER 17, 2007

Prepared by:

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Engineering and Construction

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DEPARTMENT OF THE NAVY
Naval Facilities Engineering Command Southwest
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**FINAL
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN)
SCAPS LASER INDUCED FLUORESCENCE
TARRY REFINERY WASTE INVESTIGATION
FORMER OIL REFINERY
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

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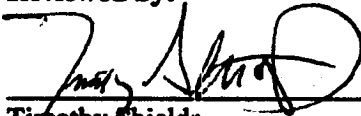
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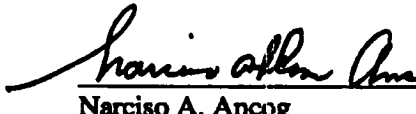
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TABLE 1-1
ELEMENTS OF UFP-QAPP, EPA QA/R-5 AND CORRESPONDING SECTION(S) IN THE SAP
IR SITE 13 – ALAMEDA POINT, ALAMEDA, CALIFORNIA

UFP-QAPP Worksheet	U.S. EPA QA/R-5 SAP ELEMENT	IR SITE 13 SAP	Variance from UFP-QAPP
#1 Title and Approval Page	A1 Title and Approval Sheet	Title and Approval Page	None
#2 QAPP Identifying Information	A2 Table of Contents	Table of Contents; Sections 1.0 and 1.5	None
#3 Distribution List	A3 Distribution List	Table 1-2 (Worksheet #3)	Internal Document Control Number (DCN) will be provided on the Final SAP as required. This table precedes the TOC.
#4 Project Personnel Sign-Off Sheet	A4 Project/Task Organization	1.5 Project Organization and Responsibilities; Table 1-3 (Worksheet #4)	None
#5 Project Organization Chart	A4 Project/Task Organization	1.5 Project Organization and Responsibilities; Figure 1-2	None
#6 Communication Pathways	A4 Project/Task Organization	1.5 Project Organization and Responsibilities; Table 1-4 (Worksheet #6)	None
#7 Personnel Responsibilities and Qualifications Table	A4 Project/Task Organization	1.5 Project Organization and Responsibilities	None
#8 Special Personnel Training Requirements Table	A8 Special Training/Certification	1.5.2 Special Training Requirements	None
#9 Project Scoping Sessions Participants Sheet	A6 Project/Task Description	N/A	Sign-in sheets and meeting minutes of scoping sessions are maintained in the Navy project file.
#10 Problem Definition	A5 Problem Definition/Background	1.4 Problem Definition and 3.4 Data Quality Objectives	None
#11 Project Quality Objectives/Systematic Planning Process Statements	A7 Quality Objectives and Criteria	3.4 Data Quality Objectives	None
#12 Measurement Performance Criteria Table	A7 Quality Objectives and Criteria	4.4.1 Field Quality Control Samples; Table 4-6 (Worksheet #12)	None

Table 1-1 continued

UFP-QAPP Worksheet	U.S. EPA QA/R-5 SAP ELEMENT	IR SITE 13 SAP	Variance from UFP-QAPP
#13 Secondary Data Criteria and Limitations Table	A7 Quality Objectives and Criteria	N/A	Secondary data will not be used in conjunction with this project for risk assessment.
#14 Summary of Project Tasks	A6 Project/Task Description	1.4 Problem Definition and Proposed Tasks 3.4.7 Step 7: Sampling Design 4.1.2 Rationale for Selecting Analytical Methods; Table 4-1 4.2 Analytical Methods; Table 4-4 5.0 Assessment and Oversight 6.1 Data Review, Verification, and Validation	None
#15 Reference Limits and Evaluation Table	A7 Quality Objectives and Criteria	3.4 Project Action Levels and Analytical Quality Assurance Objectives; Table 4-4 (Worksheet #15)	None
#16 Project Schedule/Timeline Table	A6 Project/Task Description	1.5.1 NAVFAC SW Responsibilities	None
#17 Sampling Design and Rationale	B1 Sampling Process Design	4.1 Sampling Process Design	None
#18 Sampling Locations and Methods/SOP Requirement Table	B2 Sampling Methods	4.2 Field Methods and Procedures; Table 4-2 (Worksheet #18)	None
#19 Analytical SOP Requirement Table	B4 Analytical Methods	4.3 Analytical Methods; Table 4-3 (Worksheet #19)	None
#20 Field Quality Control Sample Summary Table	B5 Quality Control	4.4 Quality Assurance Objectives for Measurement; Table 4-5 (Worksheet #20)	None
#21 Project Sampling SOP Reference Table	B2 Sampling Methods	4.2 Field Methods and Procedures	None
#22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	B6 Instrument/Equipment Testing, Inspection, and Maintenance B7 Instrument/Equipment Calibration and Frequency	4.5 Equipment Testing, Inspection and Maintenance; Table 4-7 (Worksheet #22)	None
#23 Analytical SOP Reference Table	N/A	4.3 Analytical Methods	None

Table 1-1 continued

UFP-QAPP Worksheet	U.S. EPA QA/R-5 SAP ELEMENT	IR SITE 13 SAP	Variance from UFP-QAPP
#24 Analytical Instrument Calibration Table	B7 Instrument/Equipment Calibration and Frequency	4.4.2.1 Calibration	None
#25 Analytical Instrument and Equipment, Maintenance, Testing, and Inspection Table	B6 Instrument/Equipment Testing, Inspection, and Maintenance B7 Instrument/Equipment Calibration and Frequency	4.4.2.1 Calibration 4.5 Equipment Testing, Inspection and Maintenance	None
#26 Sampling Handling System	B3 Sample Handling and Custody	4.2.7 Sample Handling Documentation	None
#27 Sample Custody Requirements	B3 Sample Handling and Custody	4.2.7 Sample Handling Documentation	None
#28 QC Samples Table	B5 Quality Control	4.4 Quality Assurance Objectives for Measurement	None
#29 Project Documents and Records Table	A9 Documents and Records	4.8 Field Methods and Procedures; Table 4-8 (Worksheet #29)	None
#30 Analytical Services Table	N/A	4.3.1 Laboratory Requirements	None
#31 Planned Project Assessment Table	C1 Assessment and Response Actions	5.1 Assessment and Response Actions	None
#32 Assessment Findings and Response Actions	C2 Reports to Management	5.2 Reports to Management	None
#33 QA Management Reports Table	B10 Data Management	4.8 Data Management	None
#34 Sampling and Analysis Verification (Step 1) Process Table	D2 Validation and Verification Methods	6.1 Data Review, Verification, and Validation; Table 6-1 (Worksheet #34)	None
#35 Sampling and Analysis Validation (Steps 2a and 2b) Process Table	D2 Validation and Verification Methods	6.1 Data Review, Verification, and Validation	None
#36 Sampling and Analysis Validation (Steps 2a and 2b) Summary Table	D1 Data Review, Verification, and Validation	6.1 Data Review, Verification, and Validation	None
#37 Data Usability Assessment	D3 Reconciliation with User Requirements	6.2 Reconciliation with User Requirements	None

I certify that this SAP is in compliance with the latest version of the UFP-QAPP and the EPA QA/R-5

Jesse MacNeill
Jesse MacNeill, RBA QA Manager

[Signature] 10/17/07
Signature Date

TABLE 1-2
DISTRIBUTION LIST (UFP-QAPP WORKSHEET #3)
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Mr. Rod Soule *	NTR	NAVFAC SW EVS	619-532-3178	roderick.soule@navy.mil
Ms. Diane Silva	Administrative Record	NAVFAC SW	619-532-3676	diane.silva@navy.mil
Mr. Douglas DeLong	EMC	BRAC PMO West	415-743-4713	douglas.delong@navy.mil
Mr. Gregory Grace	ROICC	Alameda Point	510-749-5940	gregory.grace@navy.mil
Ms. Anna-Marie Cook	Project Manager	U.S. EPA	415-972-3029	cook.anna-marie@epa.gov
Ms. Dot Lofstrom	Project Manager	DTSC	916-255-6449	dlofstro@dtsc.ca.gov
Mr. John West	Project Manager	Waterboard	510-622-2355	jwest@waterboards.ca.gov
Ms. Sophia Serda	Project Manager	U.S. EPA	415-972-3057	serda.sophia@epa.gov
Ms. Karla Brasaemle	Project Manager	Tech Law, Inc.	415-281-8730	kbrasaemle@techlawinc.com
Mr. Peter Russell	Project Manager	Russell Resource, Inc.	415-492-0540	peter@russellresources.com
Mr. George Humphreys	RAB Co-Chair	Alameda RAB	Not available	Not available
Mr. Craig Hunter *	Project Manager	Tetra Tech EMI	916-853-4507	Craig.hunter@ttemi.com
Mr. John McMillan *	Project Manager	Shaw Environmental and Infrastructure, Inc.	925-288-2223	John.McMillan@shawgrp.com
Ms. Deanna Rhoades *	Project Manager	Sullivan International Group, Inc.	619-260-1432	drhoades@onesullivan.com
Mr. Jesse MacNeill	QA Manager	RBA	619-571-4931	jmacneill@rbrady.net
Mr. Donald McHugh	Project Manager	RBA	619-316-0597	dmchugh@rbrady.net
Mr. Timothy Shields	Program Manager	RBA	619-571-4176	tshields@rbrady.net

* CD-ROM copy distributed.

TABLE 1-3
PROJECT PERSONNEL SIGN OFF SHEET (UFP-QAPP WORKSHEET #4)
IR SITE 13 – ALAMEDA POINT, ALAMEDA, CALIFORNIA

Project Personnel	Organization	Title	Signature	Date QAPP Read
Ms. Michelle Hurst	BRAC	RPM		
Mr. Timothy Shields	RBA	Program Manager		
Mr. Don McHugh	RBA	Project Manager		
Mr. Craig Haverstick	RBA	FOS, HSM		
Mr. Fred Essig	RBA	Field /Technical Staff		
Mr. Jesse MacNeill	RBA	QA Manager		
Mr. Jason Williams	RBA	Field Team		
Ms. Tara Lieberman	RBA	Field Team		

Note: This table will be signed as project personnel prepare for fieldwork and read the SAP.

Copies of this completed form will be included in the investigation summary report and maintained in the project files.

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ACRONYMS/ABBREVIATIONS

AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, xylenes
bgs	below ground surface
BRAC	Base Realignment and Closure
BRAC PMO	Base Realignment and Closure Program Management Office
BSU	Bay Sediment Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-Custody
CPR	cardiopulmonary resuscitation
CPT	cone penetrometer test
CSM	conceptual site model
DI	deionized
DQO	data quality objective
DTSC	Department of Toxic Substances Control
DVE	dual-phase vacuum extraction
EBS	Environmental Baseline Survey
EDF	Electronic Deliverable Format
ELAP	Environmental Laboratory Accreditation Program
EMC	
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
EWI	Environmental Work Instruction
FCN	field change notice
FS	Feasibility Study
GAP	generator accumulation point
GC/MS	Gas Chromatograph/Mass Spectrometer
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCl	hydrochloric acid
HHRA	Human Health Risk Assessment
HI	hazard index
HLA	Harding Lawson Associates
HQ	hazard quotient
HSM	Health and Safety Manager

ID	Identification
IDW	investigation-derived waste
IMF	Intermediate Maintenance Facility
IR	Installation Restoration
IRCDQM	Installation Restoration Chemical Data Quality Manual
JP	jet propellant
LCS	laboratory control sample
LIF	laser-induced florescence
MBS	method blank spike
MCL	maximum contaminant level
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
MSL	mean sea level
NACIP	Navy Assessment and Control of Installation Pollutants
NADEP	Naval Aviation Depot
NAVFAC SW	Naval Facilities Engineering Command Southwest
NEDD	Navy Electronic Data Deliverable
NEDTS	Navy Environmental Data Transfer Standard
NELAP	National Environmental Laboratory Accreditation Program
NFESC	Naval Facilities Engineering Service Center
OSHA	Occupational Health and Safety Administration
OWS	oil water separator
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PG	Professional Geologist
pH	potential of hydrogen
PID	photo ionization detector
POL	petroleum, oil, and lubricant
PPE	personal protective equipment
PRC	preliminary remediation criteria
PRG	preliminary remediation goal
PWC	(Navy) Public Works Center (San Diego)
QA	quality assurance
QAO	Quality Assurance Officer
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan

QC	quality control
RBA	Richard Brady & Associates
RI	Remedial Investigation
RL	reporting limit
RPD	relative percent difference
RPM	Remedial Project Manager
RV	recreational vehicle
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCAPS	Site Characterization and Analysis Penetrometer System
SOP	standard operating procedure
SVOC	semi-volatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
SWMU	solid waste management unit
TBD	to be determined
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons quantified as diesel
TPH-g	total petroleum hydrocarbons quantified as gasoline
TPH-mo	total petroleum hydrocarbons quantified as motor oil
TRPH	total recoverable petroleum hydrocarbons
TRW	tarry refinery waste
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
µg/L	micrograms per liter
µg/kg	micrograms per kilogram
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been completed by Richard Brady & Associates (RBA) for a Site Characterization and Analysis Penetrometer System (SCAPS) investigation at Installation Restoration (IR) Site 13, Alameda Point, Alameda, California (Figure 1-1). This plan was prepared under subcontract to Shaw Environmental, Inc., for Naval Facilities Engineering Command Southwest (NAVFAC SW).

This SAP is intended to provide a clear strategy to obtain data that can be reliably used in making the required project decisions. As such, the SAP was prepared to ensure that the data collection procedures and measurements for this investigation are scientifically sound and of known, acceptable, and documented quality. The format and contents of this SAP include a field sampling plan and the required elements from the United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (QAPP), QA/R-5 (EPA, 2001) and from Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005; SWDIV 2006). Table 1-1 presents the comparison of the required elements and the corresponding sections in this SAP.

Several environmental investigations have identified the presence of black, tarry, and asphaltic residues in soils within IR Site 13. These observations are supplemented by analytical results, which demonstrate elevated levels of petroleum-related compounds associated with the residues. The residue is believed to be tarry refinery waste (TRW) disposed of at the site during historic oil refinery operations, which pre-date military activities. The subsurface distribution, chemical nature, and variability of TRW is not defined with sufficient resolution to make the best decisions regarding remedial alternatives at IR Site 13.

1.1 Facility Location

Alameda Point is located at the western end of Alameda Island near the northwestern corner of Alameda County, California (Figure 1-1). Alameda Island is located at the eastern edge of San Francisco Bay adjacent to the City of Oakland. Alameda Point is approximately 2 miles long and 1 mile wide, and occupies 2,634 acres.

Originally a peninsula, Alameda Island was detached from the mainland in 1876 when a channel was cut to link San Leandro Bay with the San Francisco Bay. The northern portion of Alameda Island was formerly tidal areas, marshlands, and sloughs adjacent to the historic San Antonio Channel, now known as the Oakland Inner Harbor. During the late 1800s, the eastern portion of the base was used for industrial purposes. Specifically, the Pacific Coast Oil Company operated a refinery along the western shore of the island (SulTech, 2005a).

1.2 Investigation Objectives and Scope

The existing conceptual site model (CSM) leaves uncertainty regarding the thickness, spatial distribution, and variation in the chemical nature of the TRW disposed of during historic oil refinery operations at IR Site 13. These uncertainties in the CSM increase the difficulty of the decision making process when preparing planning documents for the site.

The Navy has identified the SCAPS laser-induced fluorescence (LIF) technology as being appropriate to provide additional data that will reduce uncertainty about the distribution of TRW.

The purpose of the proposed SCAPS LIF investigation is to provide data that will be used to update and refine the CSM including: increasing resolution of the horizontal and vertical extent of petroleum contamination (TRW), sampling limited locations to verify the concentration and type of contaminants of concern on-site, and determining useful monitoring well locations (if monitoring wells are required/recommended in the future). Understanding the nature and extent of the TRW will support the optimization of remedial alternatives analysis in the Operable Unit 2A (OU-2A) Feasibility Study (FS).

1.3 Data Usage

The data from this investigation will be used to refine the CSM. By filling data gaps in the CSM, the decision making process will be optimized when preparing future planning documents for IR Site 13.

1.4 Problem Definition and Proposed Tasks

The primary objectives of this proposed investigation are to promote increased resolution regarding the extent of TRW and associated chemical constituents related to the historic release. In order to meet these objectives, the following tasks are proposed:

1. The SCAPS investigation will proceed by pushing the LIF probe at approximately 300 locations to approximately 15 feet bgs. The fluorescence intensity will be compared to background fluorescence and wavelength data to determine the presence of TRW contamination.
2. A minimum of five percent solid soil and TRW matrix samples will be collected from SCAPS push locations and analyzed for total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), metals, polynuclear aromatic hydrocarbons (PAHs), and general chemistry parameters by a fixed-based laboratory. TRW matrix sample locations will be selected based on real-time data to evaluate SCAPS LIF effectiveness and reduce uncertainty in the data set. All soil and TRW matrix data obtained during the planned investigation will be independently validated in accordance with the Navy IR Program guidelines for data validation.
3. The existing CSM will be refined using newly obtained data and usable historical data. This task will update the CSM.

1.5 Project Organization and Responsibilities

The purpose of establishing the project personnel organization structure is to clearly define the lines of authority and communication, as well as the responsibilities of key personnel to allow for the efficient, proper, and successful implementation of this project. Key personnel include the following:

NAVFAC SW

- Base Realignment and Closure Program Management Office (BRAC PMO) West Remedial Project Manager (RPM) – Michelle Hurst (619) 532-0939
- Base Realignment and Closure Program Management Office (BRAC PMO) West Environmental Compliance Manager (ECM) – Doug DeLong (415) 743-4713 (office), (510) 772-8832 (mobile)
- NAVFAC SW Quality Assurance Officer (QAO) – Narciso Ancog (619) 532-3046

Richard Brady & Associates, San Diego

- RBA Program Manager – Tim Shields, (619) 571-4176
- RBA Project Manager – Don McHugh, (619) 316-0597
- RBA Quality Assurance Manager – Jesse MacNeill, (619) 571-4931
- RBA Health & Safety Manager (HSM) – Craig Haverstick (619) 571-4178

Other key personnel associated with this project are indicated in the project organization chart (Figure 1-2). A Personnel Sign-off Sheet (Table 1-3) is included to document that the project personnel responsible for implementing activities such as sample collection, sample packing/shipment, analysis, quality assurance/quality control (QA/QC), and data review have read and are familiar with this SAP.

1.5.1 BRAC PMO West and NAVFAC SW Responsibilities

Table 1-4 describes the communication pathways regarding procedures for soliciting concurrence and obtaining approval between project personnel, different contractors and laboratory staff.

The responsibilities of the BRAC PMO West and NAVFAC SW personnel assigned to this project are as follows:

- The RPM is the Navy manager directly responsible for project execution and coordination with base representatives, regulatory agencies and the BRAC PMO West and NAVFAC SW management team.
- The ECM is the on-site manager providing on-site activity coordination, including site access, security, and tenant relations.
- The QAO provides government oversight of the quality assurance (QA) program, including review and approval of SAPs. The QAO has the authority to suspend affected projects or site activities if NAVFAC SW-approved quality requirements are not maintained.

1.5.2 Richard Brady & Associates Responsibilities

The specific responsibilities for the RBA personnel are described below.

- The Program Manager is responsible for all aspects of RBA's involvement in the IR Program, including assignment of adequate resources to complete the work, conducting technical reviews of deliverables, and oversight of field operations.
- The Project Manager supervises and coordinates all work performed on the project. These responsibilities include project planning and execution, scheduling, staffing, data evaluation, report preparation, subcontracts, and managing deliverables.
- The QA Manager is responsible for reviewing the SAP, developing the QA process, and supervising project audits for compliance with program procedures and specifications. The QA Manager has authority to suspend project activities if QA requirements are not adequately met.
- The Project Chemist is responsible for coordinating field sampling with the field crew and the laboratory and ensuring that the correct analyses are conducted in accordance with the SAP.
- The Health and Safety Manager is responsible for development and implementation of the Project Health and Safety Plan and for ensuring the safe, compliant execution of fieldwork.
- The Laboratory QA/QC Manager or delegate reviews at least 10% of data reports generated by each analytical.
- The Program Controls Manager assists the Project Manager by providing reports on project tracking, scheduling, and estimating.
- The Database Manager has oversight responsibility for management of the database, which is the repository of data gathered in the course of the project.
- The Field and Technical staff members are responsible for data gathering and assisting in data evaluation and report preparation.

1.5.3 Regulatory Oversight

The Navy is the lead agency. The lead regulatory agency is the United States EPA Region 9. Additional regulatory agencies providing oversight are the California Department of Toxic Substances Control (DTSC) and San Francisco Bay Regional Water Quality Control Board (Waterboard) Region 2.

1.5.4 Data Quality Objectives Planning Team

This investigation was designed using the Data Quality Objective (DQO) process. Successful implementation of this Work Plan with a dynamic work strategy using real-time data requires the involvement of the DQO planning team during the field investigation to review real-time data and confer with the field team regarding field decisions.

Members of the DQO Planning Team for this SCAPS LIF investigation are:

- Ms. Michelle Hurst, BRAC PMO West RPM
- Mr. Narciso Ancog, NAVFAC SW QA Officer
- Mr. Douglas DeLong, BRAC PMO West ECM
- Mr. Timothy Shields, RBA Program Manager
- Mr. Don McHugh, RBA Project Manager
- Mr. Jesse MacNeill, RBA QA Manager

1.5.5 Special Training Requirements

RBA personnel working on hazardous-waste project sites who are responsible for project or site activities are required to have specific training before participating in, managing, or supervising field activities. The training has covered the following areas:

- Names of personnel and alternates responsible for health and safety at a hazardous-waste project site.
- Health, safety, and hazards present on site.
- Selection of the appropriate personal levels of protection
- Correct use of personal protective equipment (PPE).
- Work practices to minimize risks from hazards.
- Safe use of engineering controls and equipment on site.
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazardous substances.
- Contents of the site-specific Health and Safety Plan (HASP).

In addition, RBA personnel and visitors to the site will be expected to adhere to the site-specific HASP.

RBA personnel engaged in activities that expose, or could expose, workers to hazardous substances and health hazards at a hazardous-waste site will receive a minimum of 40 hours of formal instruction off-site and a minimum of 3 days of actual field experience on-site under the supervision of a trained, experienced field supervisor.

Field personnel directly responsible for, or who supervise employees engaged in, hazardous-waste operations also will receive the 40 hours of initial training, 3 days of supervised on-site field experience under a trained supervisor, and at least 8 additional hours of specialized supervisor training. Training will meet the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements of 29 Code of Federal Regulations (CFR) 1910.120(e). The specialized training

will include the requirements of the health and safety program, training requirements, the PPE and personal level of protection programs, and health-hazard monitoring procedures and techniques.

Written certificates will be presented to employees who successfully complete this training. RBA employees engaged in work at hazardous waste sites also are required to undergo 8 hours of annual refresher training to maintain certificates.

The RBA field team leader, who is the on-site manager with authority delegated by the project manager to direct field operations, will be fully trained in handling hazardous-waste and will ensure that necessary preparation and coordination are complete before on-site work begins. This preparation generally consists of drafting project documents such as the Work Plan, Sampling and Analysis Plan and assisting in preparation of the site-specific HASP under guidance of the project manager.

A minimum of one member of the RBA field team will have current certification for first aid and cardiopulmonary resuscitation (CPR). The HSM ensures that appropriate field personnel maintain current certification in both first aid and CPR.

Copies of RBA health and safety training records, including course completion certifications for the initial health and safety training, first aid, CPR and refresher training, will be maintained by the HSM. The HSM implements the training requirements by notifying employees when they are due for recertification, disseminating information about courses, conducting or assisting in refresher training, and carrying out other such tasks.

1.5.6 Sampler Training

RBA personnel engaged in sampling activities have received field training and have reviewed this SAP and all relevant standard operating procedures (SOPs). RBA environmental team members have been briefed on the applicable materials from the Naval Civil Engineer Corps Officers School (CECOS) Environmental Quality Sampling course, and the RBA lead sampler has attended this course. RBA environmental team members have an average of over 10 years relevant professional experience in environmental sampling, project planning, and site characterization. SCAPS relies heavily on field experience and hands on training which is supervised by competent personnel who have a minimum of 5 years experience in all aspects of SCAPS operations. SCAPS personnel who operate the data acquisition system receive 10 days of hands on training which is taught and supervised by senior SCAPS personnel.

Soil Sampler Training

Sampling personnel are required to have training in general environmental soil sampling and for sampling soil by EPA Method 5035, specifically including use of the EnCore[®] sampling device. Training must be approved by the QA Manager and must include supervision by the QA Manager during at least one sampling event.

1.5.7 Subcontractor Training

Subcontractors who work on site will certify that their own employees have been trained for work on hazardous waste project sites. Training will meet the OSHAHAZWOPER training requirements of 29 CFR 1910.120(e). Before beginning work at the project site, the subcontractors will submit to the HSM certification of training for each employee who will be involved in fieldwork. The subcontractors will also ensure that these employees attend a pre-entry safety briefing.

The pre-entry safety briefing is designed to inform subcontractor employees of the potential risks of working with hazardous materials, site-specific hazards, the required level of personal protection, and the use of PPE. This safety briefing is conducted by the on-site health and safety coordinator or another qualified person designated by the HSM. All employees of professional services firms and technical services subcontractors will attend a safety briefing and complete a safety meeting sign-off sheet before conducting work on the site. Construction service contractors are responsible for conducting their own safety briefings.

1.5.8 Professional Registration

All geologic work performed for the project will be overseen and reviewed by a California registered Professional Geologist (PG). Registration ensures the public that those individuals licensed and certified have met defined levels of education and experience. Registration to practice geology in the State of California is required by the Geologists and Geophysicist Act, California Board of Geologists and Geophysicists.

1.6 Project Schedule

The currently proposed schedule, subject to change based on direction from the Navy or adjustments due to field conditions, is presented in Figure 1-4.

2.0 BACKGROUND

This section summarizes background information associated with IR Site 13 including site description and history, physical setting, regulatory history, previous investigations, geology and hydrogeology. This information provides the basis for development of the preliminary CSM presented in Section 3 of this SAP.

2.1 Site Description and History

IR Site 13 encompasses the majority of the former location of the Pacific Coast Oil Works Company Refinery, which operated from 1879 to 1903. The refinery formerly occupied IR Site 13 as well as adjoining IR Sites 19, 22, and 23. Historic fire insurance maps show the location of the refinery structures, which consisted of pump and lubricant houses, two laboratories, agitators, and bleaching tanks, as well as 19 iron aboveground storage tanks (ASTs), 6 iron underground storage tanks (USTs) and a storage area containing drums of oil (Sanborn, 1897). The former tanks were used to store crude oil and finished products, as well as for processes such as bleaching and condensing. The majority of refinery operations occurred in the southern portion of IR Site 13. Petroleum refinery operations in the late 1800s consisted of distilling crude oil to kerosene and fuel oil. Wastes from this type of operation would be expected to include heavier-end hydrocarbons that weather to an asphaltic-like consistency. The type and quantity of wastes and location of disposal are not documented; however, it is reasonable to assume that the refinery wastes and asphaltic residues were disposed of at the site, the surrounding tidal lands, and the native sediments of San Francisco Bay (SulTech, 2005a).

IR Site 13 is situated about 1,000 feet east of the Seaplane Lagoon and lies at the center of Operable Unit (OU)-2A (Figure 2-1). The site is approximately 17.5 acres in size, relatively flat, partially paved, and comprises primarily open space with several structures. IR Site 13 includes former jet engine test cells in Building 397, a self storage area (Buildings MS-01 through MS-10), a recreational vehicle (RV) park, the Naval Aviation Depot (NADEP) generator accumulation point (GAP) 62 (a temporary hazardous waste storage area); oil water separators (OWSs) 397A, 397B, and 397C; and several storm sewer lines. No structures from the former oil refinery remain at IR Site 13.

In February 1991, heavy rains resulted in a storm drain overflow in the vicinity of Building 397. The pool that formed was covered with a layer of free phase hydrocarbon that was later determined to be jet propellant (JP)-5 fuel that was released by an open drain valve on the jet fuel supply line in the building's fuel room. A complete investigation of this jet fuel release was conducted in March, 1991 by PRC Environmental Management, Inc. (PRC, 1992).

Located to the south, within Site 23, is Building 530, which operated as a missile rework facility. The paved area directly west of Building 530 was used for aircraft defueling between 1958 and 1985 (Tetra Tech, 2003). To the east of Building 530 is the mini-storage area, also within the boundaries of IR Sites 13 and 23. The area is currently occupied by rows of cinder-block storage structures, and little is known about historic use of this area.

Currently, approximately 90 percent of IR Site 13 consists of open space. Approximately half of the ground surface is exposed soil, and the other half is paved with asphalt or concrete with some minor areas of exposed soil and weeds. Current uses for the site include vehicle parking, storage, and a bicycle path (SulTech, 2005a).

2.2 Physical Setting

Alameda Point is located at the western end of Alameda Island, which lies at the base of a generally western-sloping plain that extends from the Oakland-Berkley hills on the east to the shore of the San Francisco Bay on the west (Figure 1-1). The island is also bordered by the San Francisco Bay to the south, and the Oakland Inner Harbor to the north (Tetra Tech, 1998).

The San Francisco Bay Area (Bay Area) experiences a maritime climate, with mild summer and winter temperatures. Prevailing winds in the Bay Area are from the west. Because of the varied topography in the Bay Area, climate conditions vary considerably throughout the region. Heavy fogs occur on an average of 21 days per year. Rainfall occurs primarily during the months of October through April. The installation averages about 18 inches of rainfall a year. There are no naturally occurring surface streams or ponds on the installation, so precipitation either returns to the atmosphere by evapotranspiration, runs off into the storm drain system that discharges into the San Francisco Bay, or infiltrates to groundwater (Tetra Tech, 1998).

Physical features at Alameda Point include runways, streets, buildings, fuel lines, USTs, ASTs, utility lines (sanitary sewer, storm sewer, water, and power lines). Some fuel lines, USTs, and ASTs have been removed, and others have been closed in place (Tetra Tech, 2003).

2.3 Regulatory History

The Navy initiated site investigations at Alameda Point under the Navy Assessment and Control of Installation Pollutants (NACIP) Program in 1982. On June 6, 1988, the Navy received a Remedial Action Order from the California Department of Health Services (currently the DTSC) that identified a total of 20 sites, which included IR Site 13, as needing a RI and FS in conformance with requirements set forth in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In 1988, the Navy converted its NACIP Program into the IR Program to be more consistent with CERCLA. Alameda Point was identified for closure in September 1993, and all naval operations ceased in April 1997. In July 1999, Alameda Point was identified as a National Priorities List site by the EPA. The Navy is currently conducting investigations in accordance with CERCLA at 35 sites at Alameda Point, including IR Site 13 (Tetra Tech, 2003).

2.4 Previous Investigations

2.4.1 Soil and Groundwater Investigation, Harding Lawson Associates, 1989

In 1989, a geotechnical investigation was conducted by Harding Lawson Associates (HLA) in preparation for construction of the Intermediate Maintenance Facility (IMF), within IR Site 13. A total of 18 soil borings (B-1 through B-18) were drilled, and one groundwater monitoring well was installed (MW-1) south of Building 397. Results of the investigation indicated the presence of free-floating petroleum hydrocarbon product in one boring and petroleum hydrocarbon

staining and odors were observed in 9 of the 18 borings. Analytical results from soil samples collected during this investigation reported detectable concentrations of TPH as well as oil and grease. In addition, one boring contained an elevated lead concentration of 13,000 milligrams per kilogram (mg/kg) and a pH below 2.0 (SulTech, 2005a).

2.4.2 Phase I, II, and III IMF Investigation, PRC Environmental Management Inc., 1991

Based on the results from the HLA investigation, the DTSC requested that the Navy initiate soil removal in the center of IR Site 13, in the vicinity of soil boring B-7. In 1991, PRC Environmental Management Inc. performed a Phase I Assessment on the extent of lead contamination and low pH soils in the vicinity of soil boring B-7. Eight soil borings (B-IMF-01 through B-IMF-08) were drilled and one groundwater monitoring well was installed (M-IMF-01). Soil samples were collected from each boring and screened in the field for pH. Hydrocarbon staining and odors were observed in all borings, and 0.7 foot of free product accumulated in monitoring well M-IMF-01. Although the focus of the investigation was to determine the extent of elevated lead concentrations, selected soil samples were analyzed for total recoverable petroleum hydrocarbons (TRPH), semi-volatile organic compounds (SVOCs), and VOCs (SulTech, 2005a).

Because of discrepancies between field screening and laboratory results, DTSC requested additional pH sampling. During the Phase II field investigation, surface soil samples were collected adjacent to each of the eight Phase I boring locations, and additional subsurface samples were collected adjacent to soil borings B-IMF-04, B-IMF-06, and B-7. Laboratory and field pH results were generally consistent and confirmed low pH levels near soil boring B-7, but did not fully characterize the extent of low pH levels in soil at the site (SulTech, 2005a).

The Phase III investigation was performed to further evaluate pH and lead in the immediate vicinity of soil boring B-7. Three soil borings were advanced (B-IMF-09 through B-IMF-11), and one additional groundwater monitoring well (M-IMF-02) was installed. Analytical results reported low pH (less than 2.0) and high concentrations of lead within a 6-foot radius of boring B-7, which correlated with the presence of black-stained material (SulTech, 2005a).

2.4.3 Phase 1 and 2A CERCLA Investigation, Canonie, 1991

The Navy contracted Canonie to conduct an investigation at IR Site 13 to determine whether contamination from oil refinery operations was leaching into the groundwater. Twenty-seven soil borings were drilled (BOR-1 through BOR-27), with five borings being completed as monitoring wells (MWOR-1 through MWOR-5). Of these, 15 borings and 4 groundwater monitoring wells were located within the current IR Site 13 boundary. A total of 165 soil samples were collected at these locations and analyzed for VOCs, SVOCs, TRPH, pesticides, polychlorinated biphenyl (PCB) compounds, total organic carbon (TOC), metals, cations/anions, pH, cyanide, and general chemistry parameters. Four groundwater samples were collected, one from each monitoring well, and analyzed for VOCs, SVOCs, TRPH, metals, pesticides, PCB compounds, and general chemistry parameters (SulTech, 2005a).

Soil analytical results reported concentrations of PAHs, benzene, arsenic, iron, lead, and vanadium in excess of the 2002 residential Preliminary Remediation Goals (PRGs). PAHs were reported in several borings in soil within the saturated zone (beneath approximately 6 feet bgs) (SulTech, 2005a).

Groundwater analytical results reported concentrations of benzene, ethylbenzene, naphthalene, aluminum, iron, manganese, nickel, and vanadium in excess of the 2002 tap water PRGs. Canonie concluded that additional groundwater monitoring wells were needed to collect data to evaluate the potential risk caused by the presence of these chemicals in groundwater, as well as seasonal variations of groundwater quality and tidal influences (SulTech, 2005a).

2.4.4 Follow-On Investigation Phase 1 and 2a CERCLA Investigation, 1994

The purpose of this investigation was to collect additional chemical, geological, and hydrogeological data to further characterize the nature and extent of soil and groundwater contamination at IR Site 13, where data gaps existed from previous investigations. Field activities included a Geoprobe investigation, cone penetrometer test (CPT) investigation, Hydropunch sampling, soil sampling, monitoring well installations, and storm drain sediment sampling (SulTech, 2005a).

Soil sampling included the advancement of nine hollow-stem auger borings (B13-28 through B13-32, and M13-06 through M13-09). Soil and groundwater samples were collected to further evaluate the vertical extent and nature of petroleum hydrocarbons. Elevated concentrations of PAHs and metals were reported in various soil samples collected, and TPH quantified as motor oil (TPH-mo) was reported in all of the soil samples collected and extended to a maximum depth of 30 feet below ground surface (bgs) at the site (SulTech, 2005a).

Based upon Geoprobe and Hydropunch sampling results, five of the soil borings were completed as monitoring wells. Four of the wells (M13-06 through M13-09) were shallow and one well (D13-01) was deep.

A quarterly groundwater monitoring program was conducted from October 1994 to August 1995. Samples were collected from monitoring wells MWOR-1, MWOR-2, MWOR-4, MW-1, M13-06, M13-08, M13-09, M07C-06, M07C-07, M07C-09, and D13-01. The samples were analyzed for VOCs, SVOCs, ethylene dibromide, pesticides, PCBs, dissolved metals, cyanide, TPH, sulfide, and general chemistry parameters. Benzene and SVOCs were reported in M13-07, located near ASTs 324 through 328. Elevated concentrations of TPH quantified as diesel (TPH-d) were reported in monitoring wells in the northeast and central portions of IR Site 13. TPH-mo was reported in 3 of the 10 monitoring wells located in the east and central portions of the site. In addition, elevated concentrations of VOCs, pentachlorophenol, naphthalene, and various metals were reported in groundwater across the site (SulTech, 2005a).

It was concluded that chemicals reported in soil and shallow groundwater were similar in nature to those found during previous investigations. This investigation did not focus on TRW.

2.4.5 SCAPS Investigation, Navy Public Works Center, 1996

In November and December, 1996 the Navy Public Works Center, San Diego (PWC) conducted a SCAPS LIF investigation to assess petroleum hydrocarbons at IR Site 3, 5, 7B, and 13, as well as various other areas at Alameda Point. The purpose of the SCAPS investigation was to provide data for use by the University of California at Berkeley in support of their intrinsic bioremediation and enhanced steam extraction treatability studies. A total of 119 LIF pushes and 30 sampling pushes were advanced at the various sites (PWC, 1997).

The IR Site 13 portion of the investigation was performed in an area south of Building 397, in a large lot bounded to the west by 9th Street, to the south by Avenue L, to the east by 10th Street, and to the north by Avenue K. A total of 11 LIF pushes (IR13-01 through IR13-11) were advanced at IR Site 13. Fluorescence inferred to be a result of petroleum, oil, and lubricant (POL) impact was observed in 5 of the 11 pushes (IR13-01, IR13-02, IR13-04, IR13-07, and IR13-11), with fluorescents intensities indicative of free product in one location (IR13-01). The presence of free product in IR13-01 was visually confirmed (PWC, 1997).

2.4.6 Intrinsic Bioremediation Study, UC Berkeley, 1998

An investigation was conducted in 1998 by the University of California at Berkeley to identify intrinsic bioremediation of hydrocarbons at IR Site 13 and to estimate the rate of bioremediation. Samples were collected in the field southeast of Building 397 and analyzed to accomplish the following objectives: characterize the microbial populations present, characterize the geochemical conditions and identify the occurrence of metabolic substrates and products, and evaluate the mechanisms responsible for degradation (SulTech, 2005a).

Analytical data indicated that although biodegradation of hydrocarbons is occurring, the mode of degradation is dominated by methanogenesis and methane oxidation rather than by direct aerobic activity. Modeling results and field observations suggested that oxygen transport is hindered in the unsaturated soils above the hydrocarbons at IR Site 13, resulting in slow bioremediation rates. In addition, these results suggested that capping IR Site 13 with an impermeable surface without appropriate gas venting could result in the buildup of potentially hazardous methane gas (SulTech, 2005a).

2.4.7 Follow-On Intrinsic Bioremediation Study Investigation, 1998

The purpose of this investigation was to further characterize groundwater plumes, monitor plume movement, and collect data to model the effects of natural attenuation processes. Additionally, a tidal influence study was conducted to establish tidal effects on groundwater at Alameda Point; however, no data was collected that related to Site 13 (SulTech, 2005a).

Four quarters of groundwater monitoring and sampling were conducted from monitoring wells M13-06 and M13-09. Organic compounds, including petroleum hydrocarbons, were reported at concentrations exceeding the drinking water Maximum Contaminant Levels (MCLs) in groundwater during one or more quarters (SulTech, 2005a).

2.4.8 Emulsion Recycling Treatment Study, 2000

During February of 2000, a treatability study was conducted to demonstrate the capability of emulsion recycling to immobilize TPH and lead in soil at IR Site 13 to acceptable insoluble concentrations, while producing an engineered construction product such as road base material.

Results of the physical testing of the emulsion-treated products showed that soils exceeded specifications for an aggregate base. A construction cost estimate showed that this technology could be used at IR Site 13 for treatment of the contaminated soils for less than the cost of transporting the soil to an appropriate off-site landfill. The study recommended the results of this treatability study to be evaluated in the FS (SulTech, 2005a).

2.4.9 Storm Sewer Investigation, 2000

A basewide storm sewer investigation was conducted in 2000 to evaluate the physical condition of the storm sewer system, identify areas where sections of the storm sewer was submerged below the groundwater table, identify locations where contaminated groundwater intercepts submerged damaged sections of the storm sewer system, and identify significant data gaps for further evaluation (SulTech, 2005a).

It was concluded that most of the storm sewer system lines were at least partially submerged, and that one segment of pipe had a high priority for repair due to the vicinity of potential groundwater contamination.

2.4.10 Supplemental Data Gap Sampling, 2001

Based on identified data gaps, a supplemental sampling effort was conducted at OU-2A to address the status of groundwater contaminant plumes and evaluate preferential flow paths associated with the storm sewer system. This investigation included sampling groundwater and storm sewer bedding materials. In addition, one soil gas sample was collected within IR Site 13 (Tetra Tech, 2003).

Groundwater monitoring activities included one round of sampling of all monitoring wells at IR Site 13. Analytical results indicated that groundwater from several wells contained concentrations of TPH, and one groundwater sample contained VOCs and SVOCs. The soil gas sample collected within IR Site 13 contained VOCs (Tetra Tech, 2003).

2.4.11 Basewide Groundwater Monitoring, 2002 – 2003

The objectives of this investigation were to define the limits of contaminant plumes in groundwater, identify general types and number of plumes, and determine the main chemicals of concern at the base. The monitoring scheme for OU-2A used 23 of the 46 wells located in the 5 sites (9, 13, 19, 22, and 23). Eight wells (MW-1, D13-01, M07C-06, M07C-09, M13-06, M13-07, M13-08, M13-09, and MWOR-4) located within IR Site 13 were identified for quarterly and semi-annual monitoring. Sampling was conducted in June, September, and December 2002 and April 2003. Samples were analyzed for VOCs, TPH, dissolved metals, and general chemistry. Various filtered metals, VOCs, TPH-d, TPH-g, TPH-mo, and JP-5 were reported in numerous samples collected within IR Site 13 (SulTech, 2005a).

2.4.12 Basewide PAH Study, 2003

A basewide PAH study was conducted in 2003 to collect sufficient PAH data to calculate exposure point concentrations for ecological risk assessments and human health risk assessments at CERCLA sites. The mean and standard deviation of benzo(a)pyrene concentrations from historical PAH data were used to determine the appropriate number of PAH samples to collect from each site (SulTech, 2005a).

At IR Site 13, 66 soil borings were advanced using direct-push sample methods, and samples were collected at 4 depth intervals (0 to 0.5, 0.5 to 2.0, 2.0 to 4.0, and 4.0 to 8.0 feet bgs). In general, the concentrations of individual PAHs were low across IR Site 13, but PAH concentrations in soil samples from nine borings exceeded the action level (0.62 mg/kg) for benzo(a)pyrene equivalents (SulTech, 2005a).

2.4.13 Terrain Conductivity Mapping, Tetra Tech Inc., 2003

In June and August 2003, Tetra Tech, Inc. conducted a pilot test to evaluate the effectiveness of terrain conductivity mapping for characterizing the extent of TRW at IR Site 13. A frequency domain electromagnetic instrument capable of measuring electrical terrain conductivity was used to determine if TRW affected the soil conductivity in two pilot test areas (Tetra Tech, 2003).

After sensor readings were plotted on a map and compared with boring logs that identified the location of TRW, it was evident that conductivity was not correlated with the presence of TRW; therefore, the technology was considered not practical for mapping (SulTech, 2005a).

In addition, confirmation samples were collected to determine the chemical characteristics of the material. The samples were collected from seven areas and tested for TPH, PAHs, lead, pH, and the VOCs benzene, toluene, ethylbenzene, and xylenes (BTEX). The results indicated that the pH of the waste was as low as 1.1, and the waste contained elevated concentrations of TPH-g, TPH-d, TPH-mo, BTEX, PAHs, and lead (SulTech, 2005a).

2.5 Removal Actions

2.5.1 Tarry Refinery Waste Removal, 1940

The area once occupied by the oil refinery had been filled and surfaced by the Navy. The resulting pressure buildup from underground hydrocarbons and refinery wastes induced a surface rupture sometime in the 1940s. An area approximately 30 by 30 feet was excavated down to the old material, and a concrete slab was placed in the bottom of the excavation. The excavation was then backfilled and resurfaced. No information was provided on the location of the excavation area or the concrete slab. These procedures apparently mitigated the problem of gas pressure buildup (SulTech, 2005a).

2.5.2 Lead Removal, 1993

As part of a plan to construct a two-building IMF located south and southeast of Building 397, the Navy conducted a geotechnical investigation in 1989. Free product and hydrocarbon stains and odors were identified in select borings. The boring with the lowest pH and the highest concentrations of TPH quantified as gasoline (TPH-g), oil and grease, and lead was located in the central portion of IR Site 13. It is believed that historic fuel releases from the vicinity of Building 397 may have contributed to the free product and mobilized some of the historic contamination from the refinery. The Navy was directed by DTSC to initiate soil removal activities in the vicinity of the boring. Following three phases of additional characterization sampling near the boring, a two-phase removal action was conducted in 1993 (Tetra Tech, 2003).

Phase I removal action activities were conducted from September to October 1993. Confirmation samples indicated that residual total lead concentrations exceeded the interim cleanup level of 100 mg/kg. Additional excavation (Phase II) was performed from October to December 1994 to complete the removal action. The final excavation area measured about 25 by 30 feet and had a maximum depth of 7 feet bgs. A total of approximately 120 cubic yards of contaminated soil was excavated and shipped to a Class I Landfill. Lead concentrations in all but one confirmation sample (121 mg/kg) were below the interim cleanup goal of 100 mg/kg (Tetra Tech, 2003).

2.5.3 Free Product Removal at Building 397, 1993

After the 3,500- to 17,000-gallon spill of JP-5 in 1991, DTSC entered into an agreement with NAS Alameda for a soil cleanup action limited to contamination caused by the spill. The project scope included removal of soil contaminated by JP-5 down to the groundwater table. In February 1993, International Technology Corporation (IT) excavated test holes and collected samples to be analyzed for JP-5 and BTEX. The maximum extent of the excavation was reached on March 8, 1993, with a total of 1,310 tons of soil removed.

Numerous underground structures and abandoned pipes that contained groundwater and free product were encountered in the excavation. Due to the occurrence of free product in the excavation, it was determined by the DTSC that the installation of a recovery system was required. No information is available about the system specifications or the amount of free product that was removed (SulTech, 2005a).

2.5.4 Fuel Line Removal, 1998

A fuel line within IR Site 13 that transported JP-5 from Building 372 to the jet engine test facility in Building 397 was removed in October 1998. Three confirmation soil samples were collected from along the pipeline and analyzed for TPH. Two samples collected along the north side of Building 397 exhibited elevated concentrations of TPH (SulTech, 2005a).

2.5.5 Dual-Phase Vacuum Extraction of Residual Free Product, 2001 - 2003

A dual-phase vacuum extraction (DVE) pilot test was conducted in 2001 by IT to demonstrate the capabilities of DVE technology to recover free product from the groundwater surface and capture hydrocarbon vapors from soil. The pilot test indicated that DVE was successfully removing hydrocarbon contaminants from soil.

In 2002, a full-scale DVE system was installed on the east end of Building 397. The system began operation in 2002. Activities were suspended on September 17, 2003, because it was determined that the recovery of free product had reached an asymptotic state. A total of 1,148 pounds of TPH was removed by the DVE system (SulTech, 2005a). Currently, a No Further Action Request is being prepared by the Navy.

2.6 Geology and Hydrogeology

The subsurface materials historically encountered at IR Site 13 primarily consist of interbedded sand, silt and clay layers. Bedding appears to be somewhat continuous, but irregular over the site (PWC, 1997).

Artificial fill consisting primarily of silty sand is the uppermost lithologic unit that underlies most of IR Site 13. Below the artificial fill is a naturally occurring unit consisting of grey to black silt and clay known as the Bay Sediment Unit (BSU). The BSU reaches a maximum thickness of approximately 9 feet at the site. A layer of sediment contaminated by petroleum wastes, known as the "Marsh Crust", typically marks the top of the BSU throughout the site. Underlying the BSU, a layer of poorly graded sand known as Merritt Sand, is found at a maximum thickness of 80 feet below the majority of the site. The lower member of the San Antonio Formation (Yerba Buena Mud), consisting of fat clay, occurs below the Merritt Sand at approximately 100 feet bgs at IR Site 13 (SulTech, 2005a).

Groundwater is very shallow (less than 10 feet bgs) at Alameda Point. Depth to groundwater has been reported in previous investigations at IR Site 13 as being approximately 6 feet bgs. Groundwater flow across the site is anticipated to be west towards San Francisco Bay (PWC, 1997). Updated groundwater information is provided in the Final Work Plan.

3.0 RATIONALE

This section summarizes the rationale for the proposed investigation. The seven-step DQOs process (EPA, 2000) was used as the technical framework to develop a scientifically sound and cost-effective data collection design. DQOs are an integrated set of specifications that define data quality requirements based on the intended use of the data. In this context, the CSM is the primary tool used to evaluate existing site data, data gaps, and to establish the level of data quality needed to support defensible decision-making.

3.1 Conceptual Site Model

The initial CSM for IR Site 13 was developed during the RI process in an interactive approach by conducting environmental investigations, identifying areas of known or potential releases of chemicals to the environment, and filling data gaps. This site-specific CSM was used to support the nature and extent evaluations and risk assessments by identifying potential sources of contamination, media affected, exposure pathways, and future receptors (SulTech, 2005a).

Through environmental investigations and literature searches, physical features and activities at IR Site 13 that might have generated hazardous waste or released chemicals to the environment were identified. The following physical features and activities were identified as potential sources of contamination during the RI process:

- Oil refinery operations and disposal practices Former location of the Pacific Coast Oil Works Company Refinery that used an acid-sludge process for refining fresh crude oil. The refinery was a potential source of crude oil, kerosene, lubricating and fuel oils, and heavier-end hydrocarbons, including TRW.
- Former ASTs 324 through 328 (AOC 009) These ASTs were located in the eastern portion of IR Site 13 in the area used for aircraft storage. The capabilities and contents of the tanks are unknown; however, recent research conducted to support remediation in this area under the TPH program indicates that these tanks held dry storage (Shaw, 2007).
- Building 397 and associated OWSs 397A, 397B, 397C, and 397D Located in the northwest portion of IR Site 13; This was an aircraft overhaul plant services facility, and was a potential source of petroleum products, halogenated and nonhalogenated solvents, and aircraft fuel (JP-5).
- NADEP GAP 62 Nonpermitted RCRA GAP located in the west end of Building 397; This was a temporary storage area for 30- to 55-gallon drums containing hazardous waste, including Mil-L-23699 lubrication and engine oil. The Phase I Environmental Baseline Survey (EBS) concluded that the site did not require further investigation and no further action was recommended in the solid waste management unit (SWMU) Evaluation Report (SulTech, 2005a).
- Placement of dredged fill material used to build the island Potential source of PAHs.

As presented in the Final RI Report (SulTech, 2005a), Exposure pathways and primary and secondary release mechanisms may include the following:

- Direct release of petroleum product acids (such as sulphuric acid), PAHs, and possibly metals associated with oil refinery activities to soil.
- Direct release of petroleum products to soil and groundwater from spills around Building 397 and associated OWSs 397A, 397B, 397C, and 397D. A spill occurred during which 3,500 to 17,000 gallons of JP-5 was released from a drain valve in the eastern end of Building 397 to a floor drain connected to OWSs 397A, 397B, and 397C, which in turn drained into the storm sewer system. The jet fuel at Building 397 is not considered a CERCLA waste.
- Placement of fill material that contained PAHs.
- Secondary release from soil to air through volatilization or resuspension of particulates.
- Secondary release from soil into the food chain from plant uptake.
- Secondary release from soil to groundwater through infiltration.
- Secondary release from groundwater to air through volatilization.
- Secondary release from groundwater into domestic use through a well.

The primary focus of this investigation is the extent of contamination associated with the historic release of TRW at IR Site 13. TRW has historically been observed in borings, test pits, and seeping onto the ground surface at several locations at IR Site 13. The material is black and globular in nature with strong hydrocarbon odors. Chemicals associated with TRW include TPH, BTEX, PAHs, and lead. In addition, pH values as low as 1.1 have been reported in samples collected below the site. Black and gray sand has also been observed surrounding the waste. Samples from stained sands have historically contained elevated concentrations of TPH, xylene, ethylbenzene, and PAHs, indicating that chemicals present in TRW have diffused into nearby soil (SulTech, 2005a).

Approximately 90 percent of IR Site 13 consists of open space. Approximately half of the ground surface is exposed soil, and the other half is paved with asphalt or concrete with some minor areas of exposed soil and weeds. Current uses for the site include vehicle parking, storage, and a bicycle path (SulTech, 2005a).

The subsurface materials historically encountered at IR Site 13 primarily consist of interbedded sand, silt and clay layers. Bedding appears to be somewhat continuous, but irregular over the site (PWC, 1997). Depth to groundwater has been reported in previous investigations at IR Site 13 as being approximately 6 feet bgs. Groundwater flow across the site is anticipated to be west towards San Francisco Bay (PWC, 1997).

A conceptual site hydrogeologic model for the Alameda Point OU-2A, including IR Site 13, has been provided as Figure 3-2.

3.2 Exposure Scenarios

The residential, commercial/industrial, and construction worker scenarios were identified as potential human receptors in the RI report for IR Site 13 (SulTech, 2005a). Exposure scenarios that include ingestion of homegrown produce and ingestion, dermal contact, and inhalation of soil and groundwater were evaluated in the human health risk assessment (HHRA), Section 6.6 of the Final RI Report. Commercial/industrial and construction worker receptors were considered the most likely exposure scenarios. The most conservative cancer risk for soil for these two scenarios is within the risk management range. The most conservative hazard index (HI) was calculated as less than 1.0 for soil. The pathway for exposure to groundwater within the commercial/industrial scenario was evaluated and risk was less than 1E-06 (SulTech, 2005a).

Exposure of potential ecological receptors to contaminants through direct contact with soil and the food chain were also evaluated in the ecological risk assessment (ERA) conducted as part of the RI report (SulTech, 2005a). Results of the hazard quotient (HQ) calculations and qualitative evaluations indicated potential risk to small mammals from zinc. It was also determined that no significant risk is posed to passerines and raptors for exposure to IR Site 13 soils. Based on the lack of habitat and the planned future use of the site, it was concluded that no risks to ecological receptors were identified that require further evaluation or mitigation (SulTech, 2005a).

Analytical data from the TRW were excluded from the HHRA and ERA because the tools used were not intended for assessing risk from pure substances. In the FS report, further action was recommended for TRW at IR Site 13 because it was determined to present a serious acute human health risk based on its pH value (below 2 standard units), and it could also pose chronic health hazards, based on its elevated concentrations of PAHs, benzene, and lead (SulTech, 2005b). In addition, the ERA was reevaluated in the FS based on TRW analytical data. It was determined that IR Site 13 does not provide sufficient ecological habitat to populations of ecological receptors because it is covered by pavement, buildings, or bare ground, and plans for future site use will remain urban in nature (SulTech, 2005b).

3.2.1 Human Health

According to the NAS Alameda community reuse plan, IR Site 13 is located in the Inner Harbor land use area. The Inner Harbor area is designated Alameda Point Mixed Use (including residential) and Public/Industrial/School, and Park and Public Open Space in the Alameda Point General Plan Amendment. The Inner Harbor area is planned for mixed-use development with a major emphasis on research and development and light industrial and industrial/warehousing uses. Light industry, office and supporting retail, industry/warehousing, and services commercial uses would be allowed within the district. The most likely reuse of IR Site 13 includes commercial/industrial or research (SulTech, 2005b).

3.2.2 Ecological Resources

Current and reasonable future uses of IR Site 13 were evaluated in the RI ERA to determine the presence and potential future formation of habitat and to identify complete exposure pathways

that might exist at the site. It was determined that ecological habitat capable of supporting significant wildlife is not currently present at IR Site 13. In the Final RI Report, an exposure pathway for aquatic receptors was not considered complete, because groundwater from the site is not likely to reach the Bay (SulTech, 2005a).

Based on the lack of habitat at IR Site 13 and the planned future use of the site, no risk to ecological receptors were identified in the RI that required further evaluation or mitigation (SulTech, 2005a).

3.3 Data Quality Objectives

The following section describes the rationale for the proposed investigation. The seven-step Data Quality Objectives (DQOs) process (EPA, 2006) was used as the technical framework to develop a scientifically sound and cost-effective data collection design. DQOs are an integrated set of specifications that define data quality requirements based on the intended use of the data. In this context, the CSM is the primary tool used to evaluate existing site data, data gaps, and to establish the level of data quality needed to support defensible decision-making.

3.3.1 Step 1: State the Problem

A former oil refinery, which was located within IR Site 13, produced tarry acidic refinery wastes that resulted from an acid-sludge process used to refine fresh crude oil. These refinery wastes were disposed of on the former refinery property, and present a significant source of contamination at the site.

TRW has been observed during numerous investigations at IR Site 13; however, there is uncertainty regarding the thickness, spatial distribution, variation, and chemical nature of the TRW.

3.3.2 Step 2: Identify Goals of the Study

Primary Investigation Question: What is the extent of contamination associated with the historic TRW release at IR Site 13?

To resolve the primary investigation question, the following decision questions will have to be addressed:

- What is the vertical extent of TRW contamination at IR Site 13?
- What is the lateral extent of TRW contamination at IR Site 13?
- Can the maximum depth of TRW contamination at a given location be determined with LIF data alone?
- Are all 300 proposed SCAPS direct-push locations necessary to define the lateral extent of TRW contamination?
- What is the chemical variability of TRW?

3.3.3 Step 3: Identify Information Inputs

- Facility operational history, geologic, hydrologic, and hydrogeologic information, as well as analytical data available from previous investigations and reports.
- SCAPS LIF and CPT data.
- Corroborating data from fixed-based laboratory analysis of soil samples. Because the LIF probe displaces soil as it is pushed into the ground, soil samples must be collected from a separate SCAPS “hole” or push location. Soil samples are collected within three lateral feet of the LIF location.
- Laboratory data from the TRW investigation will be used to characterize the chemical composition of the TRW for optimization of remedial alternatives in a subsequent FS.

3.3.4 Step 4: Define the Boundaries of the Study

- The lateral study boundary of this investigation will be the boundaries of IR Sites 13, 19, and 22, and the Alameda Point Property Line to the east (Figure 3-1)
- If two consecutive LIF pushes of background fluorescence are recorded throughout the entire length of the push in a direction away from the TRW mass, then the edge of the TRW will be considered delineated.
- Unless there is evidence of deeper soil contamination, the vertical study boundary will consist of the maximum depth sampled, which is anticipated to be approximately 15 feet bgs.
- Temporal boundaries will be defined by data collected during this investigation, which will therefore reflect current site conditions.
- Physical constraints may be presented by site locations that are inaccessible to SCAPS.

3.3.5 Step 5: Analytical Approach

1. *If* LIF intensity at a depth exceeds background fluorescence intensity (as determined by comparing SCAPS background systems check fluorescence intensity to *in-situ* intensities at various depths), *then* the fluorescence is inferred to be due to the presence of TRW and/or TRW impacted matrices and this data will be used to define the vertical and horizontal extent of TRW.
2. *If* LIF intensity at a particular location and/or depth is at background fluorescence intensity, *then* it is inferred that there is not TRW impact at that location and/or depth and this data will be used to define the vertical and horizontal extent of TRW.
3. *If* LIF intensity does not exceed background fluorescence intensity during an entire push (to approximately 15 feet bgs), *then* the push location will be inferred to be not impacted by TRW and may be used to define the lateral extent of TRW impact.
4. *If* fixed-based laboratory analysis reports detectable TPH-d and/or TPH-mo concentrations from a soil sample collected 1) from a location within 3 lateral feet of the

LIF push location and 2) from a depth interval of inferred TRW fluorescence, *then* TRW fluorescence is confirmed. Soil sample analytical results will be screened against project remediation criteria for TPH, BTEX and PAHs including naphthalene.

5. *If* fixed-based laboratory analysis reports concentrations less than 1,380 mg/kg TPH-d and 1,900 mg/kg TPH-mo, the project remediation criteria (PRCs) established in the TPH strategy in the remedial investigation report (SulTech, 2005a), from a soil sample collected from a location of background fluorescence, *then* the TRW impact below project remediation criteria is confirmed and this data will be used to define the vertical and horizontal extent of TRW.
6. *If* fixed-based laboratory analysis reports TPH-d and/or TPH-mo concentrations greater than project remediation criteria in a soil sample collected from a location of background fluorescence, *then* LIF data alone may not sufficiently evaluate TRW impact and additional sampling may be recommended using alternate methodology.
7. *If*, based on LIF intensity the lateral extent of TRW contamination is considered defined prior to the advancement of all direct-push locations shown on Figure 3-1, *then* the field team may eliminate proposed locations as appropriate.
8. *If* two consecutive LIF pushes of background fluorescence are recorded throughout the entire length of the push in a direction away from the TRW mass, *then* the edge of the TRQ will be considered delineated.
9. *If* the lateral extent of TRW contamination is not considered defined by the direct-push locations shown on Figures 3-1, *then* additional proposed locations may be recommended.

3.3.6 Step 6: Specify Performance or Acceptance Criteria

There are two types of decision errors: sampling design errors and measurement errors. Sampling design errors are a function of the selection of sample locations or analytical methods used to characterize the site to be studied. Measurement errors are a function of the procedures used to collect and analyze the samples.

In sampling designs that use a statistical approach to evaluate the data using decision rules, numerical limits on allowable error can be set and controlled by the sampling design (e.g., the number of samples). The use of classical statistics for this project would indiscriminately mix potentially distinct populations into a single data set. In this case, the anticipated high variability of the data set would make it impossible to attain acceptable statistical significance.

In sampling designs that base the conclusions on the judgment of the decision makers, decision errors are reduced by subjective definition of the factual basis for the judgment. Based on the initial CSM for the site, the proposed sampling design is a fundamentally judgmental approach. Measurement errors that arise during the various steps of the sample-measurement process (e.g., sample collection, sample handling, sample preparation, sample analysis, data reduction, and data handling) are possible regardless of the sampling design. Neither measurement errors nor variability can be eliminated, but they can be controlled by selecting appropriate procedures. The

analytical methods and method reporting limits for soil samples are discussed in Section 4. Measurement error is further managed by using SOPs, second-party review of data records, and data quality management. Appendix A presents SOPs that will be followed to minimize and control measurement error.

Decision uncertainty is managed by increasing the density of sampling points, especially in areas where there is high uncertainty about the correctness of a decision. This is cost-effectively accomplished by using tools such as the SCAPS LIF and CPT to build a detailed CSM in near real-time. By collecting and analyzing data in near real-time, critical data gaps are identified and filled, an accurate and complete CSM is developed, and field mobilizations and work plan cycles are reduced. The results of this investigation will be used to optimize future planning documents. Table 3-1 presents possible decision error, identifies associated consequences, and addresses related uncertainties. The most severe error in judgmental sampling would be to conclude that action is not required when, in reality, an unacceptable risk to human-health risk and/or the environment exists. The judgmental sampling approach is designed to limit the probability of this error.

3.3.7 Step 7: Develop the Plan for Obtaining Data

The SCAPS investigation will proceed by pushing the LIF probe at approximately 300 locations. Potential push locations are presented on Figure 3-1. Push locations will be selected in the field based on real-time data. The LIF probe will be pushed to a minimum depth of 15 feet bgs at each location. The probe may be advanced deeper at the discretion of the field team. Select soil samples will be collected and analyzed by a fixed base laboratory to evaluate the SCAPS LIF effectiveness, as well as further characterize the chemical nature of TRW.

The real-time data from SCAPS LIF and CPT, as well as other real-time data, will be communicated to the DQO Planning Team on a daily basis during the field investigation. This real-time data acquisition and communication will provide the basis for a dynamic work strategy. The DQO Planning Team will optimize the sampling design by directing the field team to add investigation locations as needed, based on the decision rules in Step 5 and the results from the real-time data sources.

4.0 DATA GENERATION AND ACQUISITION

This section describes the methods and procedures to be followed during data collection activities.

4.1 Sampling Process Design

The following section presents the rationale used in the sample location selection in the proposed investigation.

4.1.1 Sampling Rationale

This investigation is designed primarily to use field methods, specifically SCAPS LIF, to delineate the extent of TRW contamination. SCAPS LIF and CPT real-time data will be interpreted to identify the presence of TRW in the subsurface.

Soil samples will be collected and analyzed for the purpose of evaluating SCAPS LIF effectiveness in accordance with analytical approaches 4, 5, and 6 as presented in the proposed sampling design rationale in Table 4-1, as well as to further characterize the chemical nature of TRW. A minimum of five percent solid soil and TRW matrix samples will be collected for fixed-based laboratory analysis. Sampling locations and depths will be identified by the field team and the DQO planning team based on the real-time LIF data.

The field team will identify locations with relatively consistent elevated fluorescence intensity through a continuous depth interval that ideally is more than 18 inches thick. This will be done in order to provide assurance that all of the soil recovered in the 18-inch-long drive sampler is from an interval of elevated fluorescence. When the location is sampled, the field team will collect the first sample in the hole from a depth interval of background fluorescence directly above the interval of elevated fluorescence. In locations where there is inadequate vertical thickness of shallow LIF background response or where TRW impact extends from the surface down to the targeted sample interval, the field team will propose an alternate background sample location. These changes will be documented in a field change notice and during the sample strategy discussion proposed before the sampling event.

Fixed-base laboratory TPH-d and TPH-mo concentrations will be applied to address DQO analytical approaches 5 and 6 as presented in the proposed sampling design rationale in Table 4-1 to confirm that background fluorescence represents concentrations below project action levels. The field team will then collect a second sample from a lower depth in the same hole. This second sample will target the interval of greatest fluorescence, and the TPH-d and TPH-mo concentrations will be applied to DQO analytical approach 4 as presented in the proposed sampling design rationale in Table 4-1.

A third soil sample will be collected from an adjacent LIF location where background fluorescence is measured through the entire push interval. This sample will be taken from a depth corresponding to the highest fluorescence at an adjacent push location, and the TPH-d and TPH-mo concentrations will be applied to address DQO analytical approaches 5 and 6 as presented in

the proposed sampling design rationale in Table 4-1. In addition, several TRW matrix samples will be collected to characterize the variability in chemical composition of TRW. Other sample locations will be selected on a judgmental basis by the field team with the goal of reducing uncertainty in the data set as presented in the proposed sampling design rationale in Table 4-1.

4.1.2 Rationale for Selecting Analytical Methods

Chemicals historically associated with TRW include TPH, BTEX, PAHs, and lead. Associated pH values as low as 1.1 have also been reported in samples collected below the site. Black and gray sand observed surrounding the TRW has historically contained elevated concentrations of TPH, xylene, ethylbenzene, and PAHs.

4.2 Field Procedures

Any field decisions requiring a deviation from the SAP will be communicated to the NAVFAC SW QAO in accordance with Environmental Work Instruction #2 (SWDIV, 2006). Minor deviations from the SAP will be documented by a field change notice (FCN). Major changes or substantive deviations from this SAP will be addressed in an addendum approved by the QAO (Table 1-4).

4.2.1 Permitting and Notification

No permanent monitoring well structures will be constructed during this investigation; therefore, no permits will be obtained.

4.2.2 Subsurface Clearance

Underground utility clearance will be completed for each subsurface investigation location. The entire area within a 6-foot radius of each potential subsurface sampling location will be cleared using the following protocol.

- Mark the potential direct-push locations and the utility lines in the immediate vicinity using color-coded surveyor paint.
- Coordinate utility-locating activities with the utility locator service.
- Coordinate utility-locating activities with Underground Service Alert.

Wherever possible, a transmitter/receiver unit will be attached to the exposed pipe or utility to trace metallic pipes or utilities that are either indicated on base utility maps or obvious via surface expression. The location of the utility will be marked on the ground using color-coded surveyor paint.

If a utility is identified within three feet of the potential sampling/drilling location, the sampling/drilling point will be moved and the clearance procedures will be repeated.

4.2.3 Surveying

SCAPS direct-push locations will be field-surveyed using a portable Trimble Global Positioning System (GPS) receiver capable of sub-meter accuracy and/or conventional survey equipment.

Each location coordinate (northing and easting) will be GPS-surveyed by the field team. Direct-push location elevations will not be surveyed.

4.2.4 SCAPS Investigation

4.2.4.1 CPT

Lithologic data will be collected using a CPT probe. The CPT is an instrumented probe that measures the cone resistance and sleeve friction of the probe penetration. Data for cone resistance and sleeve friction are simultaneously recorded in units of tons per square foot at approximately 1-inch vertical intervals. The data processing unit calculates the friction ratio (the ratio of sleeve friction to cone resistance). The friction ratio and cone resistance values are mapped to corresponding soil behavior classifications using Robertson and Campanella's method (1988), providing continuous, real-time profiling of the subsurface lithology.

4.2.4.2 LIF

SCAPS uses a CPT probe with integrated LIF capabilities to detect subsurface petroleum hydrocarbons. The LIF system is discussed in detail in Section 4.3.1 Field Methods.

4.2.4.3 Soil Sampling Methods

Soil samples will be collected using 6-inch-long, stainless steel or brass tubes and a direct-push drive sampling tool. Samples for VOC analysis will be immediately collected from the drive tube using three 5-gram EnCore[®] devices in accordance with EPA Method 5035. A minimum of five percent solid soil and TRW matrix samples will be analyzed for VOCs, PAHs, TPH-d, TPH-mo, metals and general chemistry by a fixed-based laboratory. Additional soil sample locations will be selected based on real-time data to evaluate SCAPS LIF effectiveness and reduce uncertainty in the data set as presented in the proposed sampling design rationale in Table 4-1. Soil and TRW matrix samples will be collected in accordance with the SOPs RBA T-004 and T-006 (Appendix A).

4.2.5 SCAPS Grouting Procedure

The LIF/CPT probe is equipped with an internal grout injection tube which runs the length of the probe to backfill and destroy penetrometer holes in accordance with California state regulations. The grout consists of dilute Portland cement, bentonite and Sikament (a non-toxic friction reducing additive). After the completion of each penetrometer push, the probe is withdrawn approximately 1 inch to allow grout pump pressure ejection of the sacrificial probe. The grout mixture is then pumped down the tubing to the total hole depth. As the rods are extracted, the grout mixture fills the hole under positive pressure from bottom to top. SCAPS soil sampling holes that do not extend deeper than the water table may be grouted by pouring from the surface; otherwise they will be grouted from the bottom up using a dedicated grouting probe.

4.2.6 Decontamination Procedures

The SCAPS push-rod assembly and probe are decontaminated as they are withdrawn from the subsurface by a manifold system with high-pressure water jets, located beneath the floor of the SCAPS truck. The manifold decontamination water is then recovered and contained a storage drum at the rear of the truck.

Non-disposable sampling equipment will be decontaminated to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. Decontamination of small non-disposable sample equipment will be conducted in accordance with the SOP RBA T-01 (Appendix A).

4.2.7 Management of Investigation-Derived Waste

Wastes that may be generated during the fieldwork include decontamination water, personal protective equipment, and minor quantities of soil waste. The wastes will be containerized on site and stored temporarily in 55-gallon drums or other suitable containers at the investigation lay-down area. All other waste will be transported to a suitable authorized disposal facility.

4.2.8 Sample Handling and Documentation

4.2.8.1 Sample Containers, Preservatives, and Holding Times

The RBA Quality Assurance Manager will discuss special sample preparation needs with the analytical laboratory before field sampling is conducted. Samples will be collected in the appropriate containers for the specific tests required. Sufficient volumes will be collected to perform the desired test, and to perform necessary QC tests (e.g., duplicate and matrix spike/matrix spike duplicates). Samples are collected in pre-preserved sample containers supplied by the analytical laboratories, according to the specific method preservation requirements. Field samples will be packed with ice to maintain proper QC conditions and maintain the sample temperature ($4^{\circ} \pm 2^{\circ} \text{C}$) prior to arrival at the receiving laboratory. Field samples and ice will be collectively double-bagged in plastic trash bags, taped shut, and placed in the shipping container to avoid water leakage. If the shipping container used is a "picnic type" cooler and the cooler is equipped with a drain plug, the plug will be taped shut both inside and outside to further ensure that there is no water leakage.

Each shipping container will contain a minimum of one temperature blank. The presence of the temperature blank in the container will also be noted on the chain-of-custody (COC) along with other field QC and regular samples. The laboratory will note the temperature of blank immediately upon sample receipt.

Shipping containers with samples for volatile organic analyses are required to contain a trip blank, which is provided by the laboratory.

The required sample containers, preservation, and holding times for the project are listed in Table 4-3.

4.2.8.2 Sample Designation

Each SCAPS station location will be identified with a unique Station Identification (Station ID). A SCAPS station is defined as either a single direct push location or a cluster of multiple direct push locations that, for the purposes of GPS surveying, are collocated. Collocated push locations are generally within 3 feet of each other. To maintain consistency with California GeoTracker requirements for Field Point Names, the Station ID is to have a maximum of 10 characters and will contain no spaces. The Station ID will contain a combined abbreviation of the Navy base and the site, a dash, and a sequential two- or three-character station number. Leading zeros will be used as needed to make the sequential station numbers have a consistent number of characters.

For example, the first location will be named AP13-001. If an additional push is performed to collect a soil sample within approximately 3 feet of the LIF push location, the Station ID for the soil sample will also be AP13-001. Sample number protocol is discussed below.

To provide a method of tracking each sample through collection, analysis, data review, and data reduction, a sample identification system has been established for sampling activities. Samples collected for site characterization will be labeled with a Sample ID comprised of the following sequential components, all separated by dashes:

1. The Station ID as defined above, contains an abbreviation of the Navy base, an abbreviated identification of the site, and a sequential station number.
2. A one-character designation of the matrix type, *i.e.* "S" for soil or "W" for water.
3. A two-character designation of the consecutive sample number from each matrix type collected at the station. Leading zeros are used as needed to create two characters.

Field QC samples subjected to chemical analysis, such as equipment rinsate blanks, field blanks, and trip blanks will also be named this way; sequentially numbered as collected in the field with the site characterization samples. Field QC samples will be submitted to the laboratory under blind identification. Field QC samples will *not* be identified as QC samples in the sample name or on the COC. Field QC samples will be labeled with a Sample ID comprised of the following sequential components, all separated by dashes:

1. The Station ID of the preceding station sampled (*i.e.* the station sampled immediately prior to collecting the field QC sample).
2. A one-character designation of the matrix type. Most field QC samples will be labeled "W" for water.
3. A two-character designation of the consecutive sample number of each matrix type collected, continuing from the preceding station. Leading zeros are used as needed to create two characters.

Temperature blanks will be labeled as temperature blanks. Temperature blanks are not subject to chemical analysis.

Extra sample matrix collected for the laboratory to use for laboratory QC purposes (*i.e.* matrix spike and matrix spike duplicate (MS/MSD)) will be named identical to the associated sample

collected for site characterization. The sample will be shown as a single line on the Chain of Custody, with the total number of sample containers entered in the appropriate field. A notation will be made on the chain of custody identifying these samples to be used by the laboratory for the MS/MSD.

Cross-reference information regarding the sample depth, Station ID, the assigned sample identification number, and whether the sample is a field quality control sample, will be documented on the Sample ID and Analysis Form. These forms will be maintained in the bound project logbook.

In the following hypothetical example, the first samples collected at the site are from the SCAPS station with the Station ID AP13-001. In this hypothetical situation:

- Two soil samples (each from a different depth) are collected.
- One groundwater sample is collected.
- An MS/MSD is collected for the groundwater sample.
- A field duplicate of the groundwater sample is collected.
- Following the sampling, an equipment blank and a field blank are collected.

The samples would be named as follows:

The first soil sample would be named AP13-001-S-01, referring to:

- Station ID “AP13-001” (where “AP” refers to Alameda Point, “13” refers to IR Site 13, and “001” refers to the first sequential station.
- Matrix type “S” (soil)
- Consecutive sample “01”.

Similarly, the second soil sample would be named AP13-001-S-02.

The groundwater sample would be named AP13-001-W-01, referring to:

- Station ID AP13-001
- Matrix type “W” (water sample)
- Consecutive sample “01” refers to the first water sample collected at the station.

The extra containers collected for the MS/MSD would also be labeled AP13-001-W-01 and the Chain of Custody would identify this sample to the lab for use as an MS/MSD for lab QA/QC.

The field duplicate groundwater sample – a field QC sample – would be named AP13-001-W-02.

The equipment blank would be named AP13-001-W-03, referring to:

- Station ID AP13-001, representing the Station identification of the preceding station where the sampling equipment was used.
- Matrix type “W” (water sample)
- Consecutive sample “03” refers to the third water sample related to the station.

Similarly, the field blank would be named AP13-001-W-04.

4.2.8.3 Chain of Custody Records

All samples will be recorded in COC forms using the sample identification number described in Section 4.2.7.2. COCs will be completed using waterproof ink and in a manner to ensure entries are legible. Any errors made by the individual completing the COC shall be crossed out with a single line, initialed, and dated. The COC serves as the legal documentation of the sample custody since it records the transfer of the samples from field personnel to the laboratory to ensure that no tampering occurs.

Upon receipt, the laboratory representative will sign the COC form and record the temperature of the temperature blank on the COC form and in the Sample Condition Upon Receipt form. In case of breakage and/or discrepancies between the COC form, sample identification numbers or requested analysis, the sample custodian will notify the RBA QA Manager as soon as possible. All discrepancies associated with COC forms or sample breakage will be relayed to the RBA QA Manager within 24-hours so corrective action can be implemented appropriately.

4.2.8.4 Sample Packing and Shipping

Samples will be packaged to allow the samples to be delivered to the laboratory undisturbed and in good condition. The following packaging procedures are also designed to meet EPA and DOT regulations:

- Immediately after sample collection, sample labels will be filled out and affixed to each sample container. Each sample will be placed in a re-sealable plastic bag to keep the sample container and label dry, as well as prevent any spills from coming into contact with other samples.
- Sufficient packing material will be used to prevent sample containers from making contact during shipment. Enough wet ice will be added to maintain sample temperatures at $4^{\circ}\pm 2^{\circ}\text{C}$. Field samples and ice will be collectively double-bagged in plastic trash bags, taped shut, and placed in the shipping container, to avoid water leakage. If the shipping container used is a “picnic type” cooler, and the cooler is equipped with a drain plug, the plug will be taped shut both inside and outside to further ensure that there is no water leakage.

- The COC form will be completed and signed by RBA field personnel and courier (if other than the sampler) for the samples transported to the laboratory. The COC will be placed in a re-sealable plastic bag, and taped to the inside of the shipping container lid.
- The shipping container will be closed and taped shut with strapping tape (filament-type) completely around at both ends.
- If the samples are to be delivered to the laboratory using a commercial shipment courier service, custody seals will be used on each ice chest to provide tampering detection. The signed and dated custody seals will be placed on the front right and back left of the shipping container, and will be covered with wide, clear tape.
- Samples accumulated before transfer to the laboratory will be stored in an ice-filled chest and properly protected from breakage.

Samples will not be held on site for more than 24 hours.

4.2.8.5 Project Field Logbook and Records

Proper and accurate documentation in the field logbook is necessary to prevent misidentification of samples, and to facilitate interpretation of analytical results. The field logbook will be permanently bound with consecutively numbered pages and will be assigned to a specific person who is responsible for entry of information into the logbook. This designated person will execute all entries into the logbook in indelible ink. Corrections to erroneous data will be made by crossing a line through the entry and entering the corrected information. The correction will be initialed and dated by the person making the entry. At the end of each workday, logbook pages will be signed and dated by the person. Unused portions of logbook pages will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person during the course of fieldwork, the person relinquishing the logbook will sign and date the logbook at the time it is transferred, and the person receiving the logbook will do likewise.

Information recorded in the project field logbook will include the following:

- Project name and location
- Date and time
- General weather information
- Work performed
- Field observations
- Sampling performed; including specifics such as location, type of samples, type of analyses, and sample identification
- Descriptions of deviations from this SAP
- Problems encountered and corrective actions taken
- Identification of primary field and QC samples

- QC activities

All activities related to the operation of the SCAPS LIF system are recorded separately in the SCAPS Data Acquisition Logbook as described in RBA SOP-005, SCAPS Data Acquisition Procedures for Laser-Induced Fluorescence (Appendix A).

4.3 Analytical Methods

4.3.1 Field Methods

This investigation is designed primarily to use field methods, specifically SCAPS LIF, to provide an additional data set to be used to optimize planning documents for future investigations.

4.3.1.1 LIF

The SCAPS LIF probe is a technology that has been used successfully since the early 1990s by Navy, Army, and the Department of Energy (DOE) to investigate fuel sites. The commercial version of LIF – the Rapid Optical Screening Tool (ROST) – has been successfully deployed for a similar amount of time.

The LIF sensing technologies deployed on the SCAPS CPT platform have been developed through the collaborative effort of the Navy, Army and Air Force under the Tri-Service SCAPS Program. The SCAPS has been certified or validated by several technology certification programs, including the following:

- California Environmental Protection Agency (Cal EPA) - Technology Certification Program
- U.S. EPA, Department of Defense and Department of Energy - Consortium for Site Characterization Technology
- Western Governor's Association Committee to Develop On-Site Innovative Technologies
- Interstate Technology and Regulatory Cooperation Program

Since validation by the above programs, the Navy west coast SCAPS team has successfully investigated sites overseen by the following entities:

- The U.S. EPA
- California Department of Toxic Substances Control
- California Regional Water Quality Control Boards
- Washington State Department of Ecology
- Wyoming Department of Environmental Quality

- Several local oversight agencies

The LIF probe augments the above-described standard CPT capabilities to include POL detection. SCAPS uses the LIF via the push-rod and probe fiber-optic cable system to detect relative subsurface soil POL concentrations. The LIF provides measurements of POL to depths of up to 150 feet with a vertical resolution of approximately 2 inches as the probe is pushed into the ground at a rate of 3 feet per minute.

The SCAPS 308-nanometer xenon-chloride laser technology is best suited for investigating sites that include compounds containing two-ring (or greater) polynuclear aromatic hydrocarbons (PAH), such as aviation gasoline (AVGAS), gasoline, JP-4, JP-5, diesel fuel, or oils.

As the LIF probe is pushed into the ground, laser light is transmitted via fiber optics within the rod-probe assembly. The light is transmitted to the soil through an optical window mounted in the probe. As the optical window passes by the soil, the polynuclear aromatics contained in POL are induced to fluoresce. This fluorescence signal is carried back to the surface through a second optical fiber in the probe-rod assembly. The return signal is analyzed by a linear photodiode array spectrophotometer and recorded on the onboard computer.

As the probe is advanced, computer-generated real-time continuous logs of fluorescence intensity and wavelength are produced simultaneously with the CPT soil resistance, cone pressure and soil classification logs. Fluorescence intensity, wavelength logs, and spectral curves are used to evaluate the relative abundance of subsurface POL contaminants and to evaluate whether or not different types of POL are present. Factors that determine petroleum hydrocarbon detection by LIF are displayed on Figure 4-1.

4.3.2 Laboratory Analytical Methods

The laboratory analytical methods used for this project will be EPA Method 8260B for VOCs, EPA Method 8270C for PAH analysis of TRW matrix samples, EPA Method 8270 SIM for PAH analysis of soil samples to confirm delineation of TRW impact above PRCs and potential use in risk assessment, EPA Method 8015 for TPH, EPA Method 6010B for metals, EPA Method 150.1 for pH, EPA Method 300.0 for Sulfate, Nitrite, and Nitrate, and Method SM 2320B for alkalinity. The laboratory analytical methods will be performed in accordance with EPA SW-846, Update III (EPA, 1997) and with the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM) (NFESC, 1999).

4.3.2.1 Laboratory Requirements

Soil samples will be shipped to a California state-certified and Naval Facilities Engineering Service Center (NFESC)-evaluated laboratory qualified to perform the proposed work within standard 30 day turnaround time. All analytical methods will be performed in accordance with the Navy IRCDQM (NFESC, 1999).

4.3.2.2 Reporting Limits

For this project, every attempt will be made to ensure that the reporting limit (RL), also referred to as the practical quantitation limit, for each parameter is lower than the PRC. Analytical methods have been selected based on the capability to meet these criteria (Table 4-4). Actual

reporting limits are sample-specific however, and may differ from those presented in Table 4-4. Elevated reporting limits are generally the result of sample dilution or detections that have been associated with field and/or laboratory contamination during data validation. In the case where the reporting limit exceeds the specified screening criteria, non-detect results will be evaluated on an individual basis and will be addressed as a factor in the uncertainty associated with the decision-making process. In addition, results reported below the RL but above the method detection limit (MDL) will be qualified as estimated to indicate the increased uncertainty within this range.

4.4 Quality Assurance Objectives for Measurement

4.4.1 Field Quality Control Samples

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples for this project will include trip blanks, equipment rinsate blanks, field blanks (source blanks), and temperature blanks (Table 4-5). The measurement performance criteria for field QC samples by which these data will be compared are presented in Table 4-6.

4.4.1.1 Trip Blanks

Trip blanks are hydrochloric-acid (HCl)-preserved organic-free water prepared by the laboratory in 40-mL vials that will be carried into the field, stored with the samples, and returned to the laboratory for VOC analysis. Trip blanks will be used to determine whether samples have been cross-contaminated with VOCs during sample collection and transportation. Since trip blanks pertain only to VOCs, the vial must be free of any headspace. Trip blanks will be provided in each cooler containing samples for fixed-based laboratory VOC analysis.

4.4.1.2 Field Duplicate Samples

Field duplicates consist of a sample collected from one location that is split into two separate samples prior to submittal to the laboratory. However, due to the constraints associated with homogenizing samples in the field when they are being analyzed for both organic and inorganic fractions, soil field duplicates are often collected as co-located samples (adjacent to each other). Data generated from these analyses are usually intended to measure sampling precision or matrix variability. Due to the large variability inherent in soils, a significant large number of field duplicates would be necessary for an adequate assessment of sampling precision. Considering the objectives of this investigation, there is greater value in the collection of additional site samples. For this reason, field duplicate soil samples will not be collected during this investigation.

4.4.1.3 Equipment Rinsate Samples

Equipment rinsate samples (equipment blank) will be collected daily if non-disposable sample equipment is used. Rinsate samples consist of deionized water collected from the same source as the final rinse of the decontamination process. Rinsate samples will be collected from the sample equipment and placed in appropriate containers supplied by the analytical laboratory, and

analyzed for the same analyses as the field samples. Equipment rinsate sample results will be used to evaluate the effectiveness of the decontamination procedure and potential cross-contamination during sampling events.

4.4.1.4 Field (Source) Blanks

Field blanks consist of deionized water collected from the same source as the final rinse of the decontamination process. One sample will be collected from each water source used for decontamination. The sample is collected by pouring directly from the deionized (DI) container into the sample container, under the same ambient conditions as the principle samples are acquired. The field blank will be analyzed for the same analytical parameters as the environmental samples. Field blank results will be used to evaluate if the water used for decontamination of sampling equipment contains detectable contaminants.

4.4.1.5 Temperature Blanks

Temperature blanks are prepared by filling 40-mL glass volatile organic analysis (VOA) vials with deionized water. A temperature blank will be provided in each cooler sent to every contracted laboratory. The lab will measure the blank using a calibrated mercury or digital thermometer at the time of receipt and will record the temperature on the COC and/or cooler receipt forms. The temperature of the blank should not be higher than 6°C or lower than 2°C. If the temperature is outside this range, the lab will inform the Project Manager immediately. Corrective actions will be decided after further review.

4.4.2 Laboratory Quality Control

Laboratory QC will be monitored during analysis of project samples to assess the precision and performance of the laboratory analytical process. Laboratory QC measures for this project will include calibration, instrument blanks, method blanks, laboratory control samples, matrix spike and matrix spike duplicates, and ongoing assessment of analytical quality assurance objectives.

4.4.2.1 Calibration

The laboratory is required to document calibration procedures in accordance with the Navy IRCQM (NFESC, 1999). Instrument calibration ensures that the analytical system is operating correctly and functioning at the proper sensitivity.

All instruments and equipment must be calibrated in accordance with the specified methods unless different instructions are included in this document. Initial calibrations are performed when the method is first used; and again whenever continuing calibrations fail to meet the respective acceptance criteria. In addition, if the instrument undergoes significant maintenance, the initial calibration must be repeated.

Continuing calibrations are used to verify that the instrument performance has remained within the limits set at the time of the initial calibration. The frequency of continuing calibrations is method-dependent and defined in the cited methods and laboratory standard operating SOPs.

4.4.2.2 Instrument Blanks

Instrument blanks are analyzed to ensure that analytes from previous runs are out of the system and do not contaminate succeeding runs. Instrument blanks must be run following calibration runs, before sample analyses are performed, and after analysis of samples containing high concentrations of potentially interfering materials.

Target analytes must not appear in the instrument blanks at concentrations greater than the required quantitation limits. If the laboratory consistently observes contaminants in the instrument blanks, the laboratory must investigate the source of the contamination and eliminate it, if possible.

4.4.2.3 Method Blanks

Method blanks are prepared in the same manner as the samples, using the same reagents as for the samples. The method blank is used to check that the equipment and reagents used in preparing the samples are free of contaminants that could interfere with the analysis.

The method blank must not exhibit analytes at concentrations greater than the required quantitation limits. If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis sequence must be stopped, the source of contamination identified and corrected, and the analysis repeated. Contamination in the method blank could mean that the entire associated batch of extracts or digestates must be re-prepared. Therefore, it is very important to make sure that no such contamination is present.

4.4.2.4 Laboratory Control Samples

A laboratory control sample (LCS) or method blank spike (MBS) is a purchased sample containing known concentrations of specific target analytes. It can also be prepared by spiking known amounts of target analytes into a well-characterized blank matrix (i.e. MBS). The matrices will be laboratory reagent water for water samples and clean sand for soil. The LCS is prepared and analyzed with the associated samples, using the same reagents. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be re-prepared, together with a new LCS, and reanalyzed. LCS recoveries will be used to demonstrate that the method is operating within acceptable limits.

4.4.2.5 Matrix Spike and Matrix Spike Duplicates

A minimum of one matrix spike will be prepared and analyzed for every analytical batch, or with every 20 samples, whichever is more frequent. Matrix spike recoveries will be used to measure the effects of interferences in the sample matrix and reflect the overall accuracy of the determination. A duplicate spike will also be prepared for analysis in every analytical batch. The relative percent difference (RPD) between the pair of spike results will be used to assess matrix specific precision.

4.4.2.6 Surrogate Spikes

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. These compounds are spiked into environmental and method QC samples requiring gas chromatography (GC) or gas chromatography/mass spec (GC/MS) analysis. The results of the surrogates are evaluated, in conjunction with other QC information, to evaluate the effect of the matrix on the accuracy of the individual sample determinations.

4.4.2.7 Internal Standards

Internal standards are compounds that are added to every VOC sample including standards and quality control samples. Internal standards are used to evaluate the efficiency of the sample introduction process and monitor the efficiency of the analytical procedure for each matrix analyzed.

4.4.3 Analytical Quality Assurance Objectives

The data quality is a function of the sampling plan rationale and the procedures used to collect the samples, as well as the analytical methods and instrumentation used. Data collected during this investigation will be evaluated with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) to determine whether the project DQOs have been met. The QC criteria by which these data will be compared are presented in Table 4-3 and are further described in the following sections.

4.4.3.1 Precision

Precision measures the reproducibility of a set of replicate results among themselves or the agreement among repeat observations made under the same conditions. Project precision will be measured by the analyses of laboratory duplicate samples as well as matrix spike and matrix spike duplicates (MS/MSD). Precision data from laboratory duplicates including MS/MSD are reported in terms of RPD between the pair of samples.

4.4.3.2 Accuracy

Accuracy measures the bias in a measurement system. A measurement is accurate when the value reported does not differ (by a specified amount) from the true value, or from the known concentration of a matrix spike or standard. The accuracy of the analytical determinations will be evaluated based on the analyses of LCS, matrix spikes (MS/MSD), and surrogate spikes (where applicable).

4.4.3.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Sample representativeness will be assessed in terms of

adherence to established sample collection procedures, required preservation, storage, and holding times

4.4.3.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount expected to be obtained under normal conditions. Completeness is determined based on the number of valid points (data not rejected) relative to the total number of validated data. In addition to validated results, broken, spilled samples, and any other problems that may compromise sample representativeness are included in the assessment of completeness. A completeness standard of 90% has been established for this project.

4.4.3.5 Comparability

Comparability expresses the confidence with which one data set is compared with another. Comparability will be achieved by the using standard methods for sampling and analyses, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats.

4.5 Equipment Testing, Inspection, and Maintenance

4.5.1 Field Equipment

The photoionization detector (PID) is an instrument commonly employed in the detection of VOCs. The PID will be used to monitor air quality for health and safety and may also be used to assist in the selection of additional samples to be analyzed in the laboratory, if such analysis is warranted. The portable PID will be inspected prior to use in accordance with manufacturer instructions. The device will be calibrated at the beginning of each day of field activities to confirm that the equipment is operational and functioning properly (Table 4-7). All calibration information will be recorded in the field logbook.

Maintenance of field equipment shall comply with the recommended maintenance procedures given in the manufacturer's operation and maintenance manuals.

4.5.2 Laboratory Equipment

Tuning, initial calibration, and continuing calibration for laboratory instruments will be completed in accordance with the method specifications. All other laboratory equipment functions will be followed as outlined in each laboratory SOP and documented in the appropriate laboratory logbook.

4.6 Inspection and Acceptance of Supplies and Consumables

Whenever possible all supplies (such as sample containers and calibration solutions) used for the project will be new and in original containers. RBA field staff will inspect all supplies prior to use to confirm that contamination or other issues do not exist that may impair the project or its

supporting environmental data. If appropriate, the lot numbers for supplies will be recorded in the field logbook.

4.7 Non-Direct Measurements

No extensive information from computer databases, literature files, or historical databases will be used for the project.

4.8 Data Management

The following sections describe the requirements for the management of hard copy and electronic data.

4.8.1 Hard Copy

All relevant raw data and documentation, including but not limited to logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least 7 years (Table 4-8). RBA will be notified 30 days before disposal of any relevant laboratory records.

RBA will maintain copies of all COC forms until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. The second copy of the report will be sent for third-party data validation.

4.8.2 Electronic Data

Field information (e.g., date and sample identification, etc.) will be entered directly into RBA's environmental database from the COC or it will be uploaded from field-generated electronic files.

Upon receipt, the electronic data will be reviewed relative to the hard copy submitted by the laboratory. The review will be conducted by the data validation contractor and will include a check for irregularities in analyte identities, concentrations, and units. Any discrepancies encountered as a result of this review will be corrected before the data is validated and ultimately uploaded into the main database. The uploaded data will also be processed to compare the fields against a list of required values. If any errors are identified, the file will be manually edited or regenerated by the laboratory. If no errors are identified, the data will be uploaded into RBA's environmental database. The laboratory database will be merged with the field database and reports will be generated from the merged database. All electronic data will be transmitted in the Naval Electronic Data Deliverable (NEDD) format in accordance with Environmental Work Instruction EWI#6 within 30 days after receipt of the final data validation package and completion of internal data verification (NAVFAC SW, 2005). All electronic data will also be transmitted in the GeoTracker Electronic Deliverable Format (EDF) format in accordance with the California State Water Resources Control Board (SWRCB) requirements.

5.0 ASSESSMENT AND OVERSIGHT

5.1 Assessment and Response Actions

Oversight of environmental data collection will be completed using three types of audits, described below. Any problems encountered during the field investigation will require appropriate corrective action procedures to ensure that the problems are resolved. This section describes the types of audits that may be completed, corrective action procedures that will be taken in the event of problems in the field or laboratory, and quality assurance reports to management.

5.1.1 Performance, System and Field Audits

An audit evaluates the capability and performance of a measurement system or its components, and identifies problems that warrant correction. RBA routinely conducts field audits to ensure that field activities are being implemented in accordance with the approved SAP. The RBA QA Manager, who is independent of the field activities, will be conducting the field audits.

Audits may include reviews of project plan adherence, training status, health and safety procedures, activity performance and records, budget status, QC data, calibrations, and conformance to SOPs. Audits may also review compliance with laws, regulations, policies, and procedures. After an audit is completed, the RBA QA Manager will submit the audit report to the project file. The RBA QA Manager will coordinate a management review of any deficiencies that are noted and will issue a corrective-action request form to identify and schedule specific corrective actions to be undertaken and completed by the project managers. The QA Manager verifies that the corrective action has been completed.

5.1.1.1 Performance Audits

The laboratory must be certified by the state of California through the Department of Health's Environmental Laboratory Accreditation Program (ELAP). In addition, the laboratory must successfully complete the NFESC laboratory evaluation process prior to receiving any samples from the project for analysis. The laboratory evaluation will be based on the latest version of the IRCDQM (NFESC, 1999).

A performance audit is a review of the existing project and QC data to evaluate the accuracy of a total measurement system or a component of the system. RBA may conduct laboratory performance audits before samples are submitted to the laboratory for analysis.

5.1.1.2 System Audits

A system audit is used to verify adherence to QA policies and SOPs. This type of audit may consist of on-site review of measurement systems. In addition, procedures for measurement, QC, and documentation may be evaluated. The first system audit is conducted shortly after a system becomes operational and on a regularly scheduled basis thereafter.

5.1.1.3 Field Audits

A field audit involves an on-site visit by the auditor or audit team. Items to be examined include the availability and implementation of approved field procedures, calibration and operation of equipment, chain-of-custody procedures and instructions, and nonconformance documentation. The Navy QAO may also conduct a field audit of this project. Items reviewed by the Navy QA officer during the field audit would be similar to those described above.

5.1.2 Corrective Action Procedures

An effective QA program requires prompt correction of non-conformance conditions that affect quality. Rapid and effective corrective action minimizes the possibility that questionable data or documentation will be produced. Two types of corrective actions exist. These are immediate and long-term action. Immediate corrective actions include correction of documentation deficiencies or errors, repair of inaccurate instrumentation, or correction of inadequate procedures. The source of the problem can usually be corrected at the time it is observed. Long-term corrective actions can include correction of systematic errors in sampling or analysis, and correction of procedures producing questionable results. Corrections can be made through additional personnel training, instrument replacement, or procedural improvements, etc.

All QA problems and corrective actions will be documented to provide a complete record of QA activities and help to identify needed long term corrective actions. Defined responsibilities are required for scheduling, carrying out, documenting, and ensuring the effectiveness of the corrective action. The following two sections describe the corrective action procedures to be followed in the field and laboratory.

5.1.2.1 Field Procedures

Field nonconformance conditions are defined as occurrences or measurements that are either unexpected or that do not meet established acceptance criteria and will affect data quality if corrective action is not implemented. Examples of nonconformance include issues such as:

- Incorrect use of field equipment
- Improper sample collection, preservation, and shipment procedures
- Incomplete field documentation, including chain-of-custody records
- Incorrect decontamination procedures
- Incorrect collection of QC samples

Corrective action procedures will depend on the severity of the nonconformance. In cases where field personnel implement immediate and complete corrective action, the corrective action will be recorded in the field logbook and summarized in the daily field progress report.

Nonconformance issues that have a substantial impact on data quality require completion of a corrective action request form. An auditor or any individual who suspects that any aspect of data integrity is being affected by a field nonconformance may fill out this form. Each form is limited to a single nonconformance. If additional problems are identified, multiple forms will be used for documentation.

Copies of the corrective action request form will be distributed to the project managers, the field team leaders, and the project file. The project manager and field team will meet to discuss appropriate steps to resolve the problem. Items to be discussed will include:

- Determine when and how the problem developed
- Assign responsibility for problem investigation and documentation
- Determine the corrective action to eliminate the problem
- Design a schedule for completing the corrective action
- Document and verify that the corrective action has eliminated the problem

The QA Manager can require data acquisition to be limited or discontinued until the corrective action is complete, and the nonconformance is eliminated. The QA/QC Manager can also request the reanalysis of any or all data acquired since the system was last in control.

5.1.2.2 Laboratory Procedures

Internal laboratory procedures for corrective action and a description of out of control situations requiring corrective action are contained in the laboratory QA plan. At a minimum, corrective action will be implemented when any of the following three conditions occur:

- Control limits are exceeded
- Method QC requirements are not met
- Sample holding times are exceeded

Out of control situations will be reported to the project analytical coordinator. In addition, a corrective action report signed by the analyst, group leader, and laboratory QA/QC Manager or designee will be provided to the project analytical coordinators.

5.2 Reports to Management

A summary of the work will be recorded in the field logbook as described in Subsection 4.2.7.5. The project manager will stay in daily verbal contact with the field crew and will report progress periodically to the BRAC PMO West RPM.

6.0 DATA VALIDATION AND USABILITY

This section describes the procedures used to review, verify, and validate field and laboratory data collected during this investigation. It also includes procedures by which existing data will be reviewed and validated.

6.1 Data Review, Verification, and Validation

The following sections discuss the overall verification and validation process that will be implemented for data generated during this investigation. The verification process involves the evaluation of the data with respect to protocols (i.e., SOPs) and project requirements, whereas the validation process involves the evaluation of the technical usability of the generated data.

Raw data collected from the field activities and used in project reports will be appropriately verified and validated, and will be included in an appendix within the site investigation report. Field and analytical data associated with previous investigations will be compiled on a site-by-site basis and will be verified to determine data quality and usability. The purpose of data verification and validation for this project is to ensure that:

- data collected meet the DQOs outlined in this document; and
- data can be used as a basis for making the required decisions at each site.

Table 6-1 describes data review, verification and validation processes and how each process will be verified, when the activity will occur, and what documentation is necessary along with the person responsible for the process.

6.1.1 Field and Laboratory Data Verification

Project personnel will verify field data collected during this investigation by reviewing the field logbook and other field documentation daily for accuracy, precision, and completeness. Any errors or inconsistencies will be resolved immediately by clarifying the issue with the appropriate field personnel. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP.

Laboratory data generated during this investigation will be subject to two levels of review within the laboratory. A chemistry supervisory-level review will be completed to verify analyte identification, quantitation, and QC data. Evidence of that review will be maintained in the form of a checklist outlining method and project requirements. The Laboratory Project Manager will work with the Laboratory QA/QC Manager to review all results, investigate QC outliers and anomalies and potential noncompliance with project requirements.

If needed, the data should be able to serve as a legal record of the field activities conducted. In order to serve these purposes, all of the following verification criteria must be met:

- Date and time of sample collection – required to uniquely identify sample and assess holding time limitations.

- Location of samples, including depth, if appropriate – required to uniquely identify samples (these data will be provided in the field logbook).
- Chain-of Custody documentation – required to demonstrate integrity of samples and maintain unique identity of samples. It includes a unique sample identification number, sample collection date and time, and signature of the persons relinquishing and receiving the sample.
- Field QA/QC procedures – required to demonstrate sample integrity; it includes field decontamination procedures to prevent cross-contamination, the collection of field blanks, and the collection of duplicate samples during each sampling activity.
- Name and location of laboratory – required for chain-of custody documentation and to verify credentials of laboratory.
- Analytical methods – required to assess appropriateness and acceptability of analytical method used.
- Detection limits – required to assess the lower limit of parameter identification.
- Holding times, and dates of extraction, analysis and preservation – required to assess whether the samples were extracted and analyzed within the holding time required.
- Laboratory QA/QC procedures – required to assess analytical accuracy and sample integrity. Spikes, duplicates, method blanks, and surrogates for each analytical batch are to be analyzed by the laboratory at appropriate frequencies.

6.1.2 Data Validation

Following data verification, data validation for data collected during this investigation will be performed in accordance with EWI #1 (SWDIV, 2001). Following the policy, an independent party with experience performing data validation for Navy projects will perform the validation. With the exception of waste characterization samples, data will be validated at 90 percent EPA Level III and 10 percent EPA Level IV. Data validation will be performed in accordance with the Navy IRCDQM (NFESC, 1999), and the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA, 1999, 2004), and QC criteria specified in this document.

For level III data validation, the data values for routine and QC samples are generally assumed to be correctly reported by the laboratory. Data quality will be assessed by comparing the QC parameters to the appropriate criteria (or limits) as specified in this SAP. If calculations for quantitation are verified, it is done on a limited basis and may require raw data in addition to the standard data forms.

Level IV or full data validation follows the EPA protocols and contract laboratory program (CLP) criteria as set forth in the functional guidelines for evaluating organic analyses (EPA, 1999). These guidelines apply to full validation data packages that include the raw data (e.g., spectra and chromatograms), backup documentation for calibration standards, analysis run logs, LCS, dilution factors, and other types of information. This additional information is utilized in the full data validation process for checking calculations for quantified analytical data. Calculations are checked for QC samples (e.g., MS/MSD and LCS data) and routine field

samples (including field duplicates, field blanks, equipment blanks, and VOC trip blanks). To ensure that detection limits and data values are appropriate, an evaluation is made of instrument performance, method of calibration, and the original data for calibration standards.

Analytical data may be qualified based on data validation reviews. Qualifiers will be consistent with the applicable EPA functional guidelines and will be used to provide data users with an estimate of the level of uncertainty associated with the result “flagged”.

Data validation results will be evaluated with respect to the attached qualifiers to determine data usability issues, if any. The following qualifiers may be assigned during the validation process.

- J – estimated concentration
- R – rejected value (unusable)
- U – not detected (e.g., not present based on blank contamination)
- UJ – sample detection limit is estimated.

Where the validation qualifiers impact the overall data interpretation and project recommendations, the report will discuss the issue and the necessary corrective action.

6.2 Reconciliation with User Requirements

The objective of this section is to evaluate the results of the task against the DQOs and requirements of the data users or decision makers.

Analytical results will be evaluated through the validation and verification steps discussed in Section 4.1 of this SAP and through the use of PARCC parameters. Limitations on the use of the data may require corrective action (i.e., re-sampling), or will be addressed as a factor in the uncertainty associated with decision-making process.

7.0 REFERENCES

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Tables

TABLE 1-4
COMMUNICATION PATHWAYS (UFP-QAPP WORKSHEET #6)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Reporting laboratory data quality issues	Laboratory Project Manager	TBD	TBD	All QA/QC issues will be reported by the Laboratory Project Manager to the Project Chemist in writing within 2 business days.
Field and analytical corrective actions	QA Manager	Jesse MacNeill	619.571.4931	QA Manager will immediately notify the Project Manager in writing of any field or analytical procedures that were not performed in accordance with this SAP. The QA Manager will complete documentation of the non-conformance and verify that the corrective actions have been implemented.
Release of analytical data	Project Chemist	Jesse MacNeill	619.571.4931	The Project Chemist will review faxed/e-mailed data to verify that data quality is met as described in this SAP prior to releasing the data. Analytical data will be released to the Project Manager (or their designee) after the Project Chemist has verified the data is in accordance with the SAP.
SAP procedure revision during field activities	Project Manager	Don McHugh	619.316.0597	The Project Manager will prepare a Field Change Notice (FCN) for any changes in sampling procedures that occur due to conditions in the field.
SAP Amendments	Project Manager and QA Manager	Don McHugh and Jesse MacNeill	619.316.0597 619.571.4931	Any changes to the SAP will require the QA Manager to prepare an addendum, which will be approved by NAVFAC SW prior to any field activities
Investigation impacting base operations	Project Manager and BRAC PMO EMC	Don McHugh and Douglas DeLong	619.316.0597 415.743.4713	The Project Manager will communicate and coordinate directly with the Alameda Point EMC and base personnel regarding impacts of the investigation to base operations.
SAP Deviations	NAVFAC SW QAO and BRAC PMO RPM	Narciso Ancog and Michelle Hurst	619.532.3046 619.532.0939	Any field decisions requiring a deviation from the SAP will be communicated to the RPM with an emphasis on relaying information to the NAVFAC QAO. Substantive deviations from the SAP will require RPM notification and QAO approval.

TABLE 3-1
QUALITATIVE ANALYSIS OF DECISION ERRORS

Possible Error	Associated Consequences	Uncertainty
Concluding that TRW contamination is present at a location when it is not present.	Investigating or cleaning up a non-impacted site.	Low: Sufficient number of samples will be collected to differentiate individual release areas, limiting coalesced "false positive" areas.
Concluding that TRW contamination is not present at the facility when it is present, or missing a source area.	Not investigating or cleaning an impacted site.	Low: The use of SCAPS LIF will optimize sampling of suspected source areas to minimize potential for missing a source area.

TABLE 4-1
PROPOSED SAMPLING DESIGN RATIONALE

Proposed Sampling Location^(a)	SCAPS LIF Sampling and Analysis Strategy	Rationale
AP13-001 through AP13-300 (TBD)	The SCAPS LIF probe will be advanced at approximately 300 locations to a total depth of approximately 15 feet bgs.	LIF results will be compared to background data to determine if TRW contamination is present.
Proposed Sampling Location(b)	Soil and TRW Sampling and Analysis Strategy	Rationale
Samples 1 - 5 Locations TBD	<p>Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples.</p> <p>Five of the fifteen soil/TRW samples will be collected from the depth intervals of the highest site-wide fluorescence.</p>	Analytical results will be used to evaluate the SCAPS LIF data effectiveness and further characterize TRW below the site and to evaluate whether variations in TRW composition influence LIF intensity and wavelength.
Samples 6 - 10 Locations TBD	<p>Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples.</p> <p>Five of the fifteen soil/TRW samples will be collected from the depth interval of background fluorescence directly above the samples with the highest fluorescence. "": If elevated fluorescence (greater than background) is detected from ground surface to the depth of highest fluorescence at a location, then the field team will propose an alternate sample location in a field change notice and during the sample strategy discussion proposed before the sampling event.</p>	Analytical results will be used to evaluate the SCAPS LIF non-detect effectiveness.
Samples 11 - 15 Locations TBD	<p>Confirmation solid soil and/or TRW matrix samples will be collected for fixed-based laboratory analysis from a minimum of 5% of the 300 LIF locations, equaling a minimum 15 samples.</p> <p>Five of the fifteen soil/TRW samples will be collected from an area where background fluorescence is measured through the entire push interval, from a depth corresponding the highest fuel fluorescence at an adjacent push location.</p>	Analytical results will be used to evaluate the SCAPS LIF non-detect effectiveness.

Notes:

- (a) Potential SCAPS LIF push locations are presented on Figure 3-1.
- (b) Potential soil and TRW sample locations will be determined based on a review of SCAPS LIF data.

Acronyms/Abbreviations:

bgs – below ground surface
 LIF – Laser-induced fluorescence
 SCAPS – Site Characterization and Analysis Penetrometer System
 TBD – To be determined
 TRW – Tarry refinery waste

TABLE 4-2A (UFP-QAPP WORKSHEET #18)
SAMPLE LOCATIONS/IDS, DEPTHS, ANALYSES AND PROCEDURES

Sample ID	Matrix	Depth (feet bgs)	Analytical Group	Reference SOP
Samples 1 – 5 Locations TBD	Soil and/or TRW	TBD	8260B, 8270C, 8015M, 6010B, 150.0, SM 2320B, 300.0	SOPs T-03, T-05, and T-06 and SAP Section 4.2.4 Soil Sampling
Samples 6 – 10 Locations TBD	Soil and/or TRW	TBD	8260B, 8270C or 8270 SIM, 8015M, 6010B, 150.0, SM 2320B, 300.0	SOPs T-03, T-05, and T-06 and SAP Section 4.2.4 Soil Sampling
Samples 11 – 15 Locations TBD	Soil and/or TRW	TBD	8260B, 8270 SIM, 8015M, 6010B, 150.0, SM 2320B, 300.0	SOPs T-03, T-05, and T-06 and SAP Section 4.2.4 Soil Sampling

Acronyms/Abbreviations:

bgs – below ground surface

ID - Identification

SOP – Standard Operating Procedure

TBD – To be determined based on real-time LIF data. The LIF data will be used to determine the vertical and lateral extent of TRW. The lateral extent of TRW will be considered defined when fluorescence levels in two consecutive perimeter samples are less than background fluorescence.

TABLE 4-2B (UFP-QAPP WORKSHEET #18)
SAMPLE LOCATIONS/IDS, DEPTHS, ANALYSES AND PROCEDURES

Sample ID	Matrix	Depth (feet bgs)	Analytical Group	Reference SOP
AP13-001 through AP13-300 -TBD	Soil and/or TRW	15	LIF	SOP T-05 and SAP Section 4.2.4 Soil Sampling

Acronyms/Abbreviations:

bgs – below ground surface

ID - Identification

LIF - Laser induced fluorescence

SOP – Standard Operating Procedure

TBD –To be determined based on real-time LIF data. The LIF data will be used to determine the vertical and lateral extent of TRW. The lateral extent of TRW will be considered defined when fluorescence levels in two consecutive perimeter samples are less than background fluorescence.

TRW – Tarry Refinery Waste

TABLE 4-3
ANALYTICAL METHODS, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Matrix	Analytical Group	Analytical / Preparation Method	Containers (number, size, type)	Preservation Requirements (chemical, temperature, etc.)	Maximum Holding Time (preparation/analysis)
Soil	Metals	6010B/3050B	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	6 months collection to analysis
Soil	Mercury	7470	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	28 days collection to analysis
Soil	VOCs	8260B/5035A	3 - 5 mg EnCore™ soil sampling devices	4°C or freeze to -10°C	48 hours collection to analysis or; 14 days if frozen
Soil	TPH extended range	8015M/3545A	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	14 days/40 days extract
Soil	PAHs	8270C SIM	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	14 days/40 days extract
Soil	Sulfate/Nitrate/Nitrite as N	300.0	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	28 days/ 48 hours (Nitrate and Nitrite)/28 days (Sulfate) extracts
Soil	Alkalinity as CaCO ₃ , Total	SM 2320B	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	14 days
Soil	pH	150.1	1 - 6-inch stainless steel or brass sleeve or 4 oz. jar w/ Teflon lined lid	Cool to 4°C	24 hours
Water*	Metals	6010B/3010A	250 ml HDPE	HNO ₃	180 days
Water*	VOCs	8260B/5030A	3-40ml VOA vials	HCL	14 days

(table continues)

Table 4-3 Continued

Matrix	Analytical Group	Analytical / Preparation Method	Containers (number, size, type)	Preservation Requirements (chemical, temperature, etc.)	Maximum Holding Time (preparation/analysis)
Water*	TPH extended range	8015M/3015C	1-1 liter amber glass	4°C	7 days/40 days extract
Water*	PAHs	8270C SIM	2-1 liter amber glass	4°C	7 days/40 days extract
Water*	Sulfate/Nitrate/Nitrite as N	300.0	500 mL poly	4°C	48 hours (Nitrate and Nitrite)/28 days (Sulfate)
Water*	Alkalinity as CaCO ₃ , Total	SM 2320B	500 mL poly	4°C	14 days
Water*	pH	150.1	500 mL poly	4°C	24 hours

Notes:

All samples must be accompanied by a temperature blank.

EPA – United States Environmental Protection Agency

Multiple analyses may be run on a single 6-inch stainless steel or brass sleeve or 4 oz. jar.

Multiple analyses may be run on the 500 mL polyethylene container.

* Water samples are trip blanks and equipment rinsates

TABLE 4-4 (UFP-QAPP WORKSHEET #15)
PROJECT ACTION LEVELS AND ANALYTICAL QUALITY ASSURANCE OBJECTIVES

Analyte	Soil						Water			
	Reporting Limit	Residential ¹ PRG	Industrial ¹ PRG	Analytical Method MDL ²	Accuracy		Reporting Limit	Analytical Method MDL ²	Accuracy	
					(% Recovery)				(% Recovery)	
					(mg/kg)	(mg/kg)			(mg/kg)	(mg/kg)
VOCs by EPA Method 8260B										
1,1,1-Trichloroethane	0.005	1,200	1,200	0.002	60-130	60-130	0.005	0.001	70-130	70-130
1,1,2,2-Tetrachloroethane	0.005	0.41	0.93	0.002	70-150	60-160	0.005	0.001	70-130	70-140
1,1,2-Trichloroethane	0.005	0.73	1.60	0.002	70-140	70-160	0.005	0.001	70-130	70-140
1,1-Dichloroethane	0.005	2.80	6	0.002	70-130	70-140	0.005	0.001	70-130	70-130
1,1-Dichloroethene	0.005	120	410	0.002	60-130	50-140	0.005	0.001	60-130	60-140
1,2-Dichloroethane	0.005	0.28	0.60	0.002	60-140	60-160	0.005	0.001	70-130	70-140
1,2-Dichloropropane	0.005	0.34	0.74	0.002	70-130	70-150	0.005	0.001	70-130	70-130
2-Butanone	0.01	22,000	110,000	0.005	50-160	40-160	0.01	0.005	60-140	60-150
2-Hexanone	0.01	-	-	0.005	60-160	40-160	0.01	0.005	70-140	60-140
4-Methyl-2-Pentanone	0.01	5,300	47,000	0.005	70-160	40-160	0.01	0.005	60-140	60-140
Acetone	0.01	14,000	54,000	0.005	40-160	30-160	0.01	0.005	50-150	50-150
Benzene	0.005	0.64	1.40	0.002	70-130	60-150	0.005	0.001	60-140	60-140
Bromodichloromethane	0.005	0.82	1.80	0.002	60-130	60-150	0.005	0.001	70-130	70-130
Bromoform	0.005	62	220	0.002	60-130	50-160	0.005	0.001	60-140	60-140
Bromomethane	0.01	3.90	13	0.002	40-160	40-160	0.01	0.001	50-140	40-140
Carbon Disulfide	0.005	360	720	0.002	50-130	40-140	0.005	0.001	50-140	40-150
Carbon Tetrachloride	0.005	0.25	0.55	0.002	50-130	50-150	0.005	0.001	70-130	60-140
Chlorobenzene	0.005	150	530	0.002	70-130	60-140	0.005	0.001	70-130	70-130
Chloroethane	0.005	3	6.50	0.002	60-150	60-150	0.005	0.001	70-140	60-160
Chloroform	0.005	0.22	0.47	0.002	70-130	70-140	0.005	0.001	70-130	70-130
Chloromethane	0.01	47	160	0.002	50-150	50-150	0.005	0.001	60-130	60-140
cis-1,2-Dichloroethene	0.005	43	150	0.002	70-130	70-140	0.005	0.001	70-130	70-140
cis-1,3-Dichloropropene	0.005	-	-	0.002	60-130	60-140	0.005	0.001	70-130	70-130
Dibromochloromethane	0.005	1.10	2.60	0.002	70-130	70-150	0.005	0.001	70-130	70-140
Ethylbenzene	0.005	400	400	0.002	70-130	70-130	0.005	0.001	70-130	70-130
m,p-Xylene	0.01	270*	420*	0.002	60-140	60-140	0.01	0.002	70-130	70-140
Methyl tert-butyl ether	0.005	32	70	0.002	60-150	60-150	0.005	0.001	70-140	60-140
Methylene Chloride	0.01	9.10	21	0.002	70-130	60-150	0.001	0.001	70-130	60-140
o-Xylene	0.005	270*	420*	0.002	60-140	60-140	0.005	0.001	70-140	70-140
Styrene	0.005	1700	1700	0.002	60-140	30-150	0.005	0.001	70-130	40-150
Tetrachloroethene	0.005	0.48	1.30	0.002	70-130	70-130	0.005	0.001	70-130	70-130
Toluene	0.005	520	520	0.002	70-130	70-140	0.005	0.001	70-130	70-140
trans-1,2-Dichloroethene	0.005	69	230	0.002	70-130	70-130	0.005	0.001	70-130	70-130
trans-1,3-Dichloropropene	0.005	-	-	0.002	60-140	60-150	0.005	0.001	70-140	60-140
Trichloroethene	0.005	0.05	0.11	0.002	70-130	60-140	0.005	0.001	70-130	60-140
Vinyl Chloride	0.005	0.08	0.75	0.002	60-150	60-150	0.002	0.001	60-150	60-160

(table continues)

Table 4-4 Continued

Analyte	Soil						Water			
	Reporting Limit	Residential ¹ PRG	Industrial ¹ PRG	Analytical Method MDL ²	Accuracy		Reporting Limit	Analytical Method MDL ²	Accuracy	
					(% Recovery)				(% Recovery)	
					LCS	MS/MSD			LCS	MS/MSD
(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	LCS	MS/MSD	(mg/L)	(mg/L)	LCS	MS/MSD	
Title 22 Metals (EPA 6010B and Mercury by EPA 7471A/7470A)										
Antimony	0.5	31	410	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Arsenic	0.5	0.062	0.25	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Barium	0.5	5,400	67,000	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Beryllium	0.5	150	1,900	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Cadmium	0.5	37	450	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Chromium	0.5	210	450	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Cobalt	0.5	900	1,900	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Copper	1	3,100	41,000	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Lead	0.5	150	800	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Mercury	0.1	23	310	0.005	75-125	75-125	0.001	0.0005	75-125	75-125
Molybdenum	0.5	390	0.0051	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Nickel	0.5	1,600	20,000	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Selenium	1	390	5,100	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Silver	0.5	390	5,100	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Thallium	1	5.2	67	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Vanadium	0.5	78	1,000	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
Zinc	1	23,000	100,000	0.05	75-125	75-125	0.001	0.0005	75-125	75-125
TPH Extended Range - Diesel	10	1,380	6,700	5	60-140	40-150	0.5	0.1	60-140	60-140
TPH Extended Range – Motor Oil	20	1,900	9,400	5	60-140	40-150	1	0.1	60-140	60-140
Acenaphthene	0.02	3,700	29,000	0.01	30-130	20-130	0.001	0.0002	30-130	20-130
Acenaphthylene	0.02	-	-	0.01	30-130	30-130	0.001	0.0002	30-130	30-130
Anthracene	0.02	22,000	100,000	0.01	30-130	30-130	0.001	0.0002	30-130	30-130
Benz(a)anthracene	0.02	0.62	2.10	0.01	40-130	40-130	0.001	0.0002	40-130	40-130
Benzo(a)pyrene	0.02	0.06	0.21	0.01	40-130	40-130	0.0002	0.0002	40-130	40-130
Benzo(b)fluoranthene	0.02	0.62	2.10	0.01	50-130	50-130	0.001	0.0002	50-130	50-130
Benzo(g,h,i)perylene	0.02	-	-	0.01	40-140	40-130	0.001	0.0002	40-140	40-130
Benzo(k)fluoranthene	0.02	6.20	21	0.01	40-130	40-130	0.001	0.0002	40-130	40-130
Chrysene	0.02	62	210	0.01	40-130	40-130	0.001	0.0002	40-130	40-130
Dibenzo(a,h)anthracene	0.02	0.06	0.21	0.01	40-130	40-130	0.001	0.0002	40-130	40-130
Fluoranthene	0.02	2,300	22,000	0.01	40-130	40-130	0.001	0.0002	40-130	40-130
Fluorene	0.02	2,700	26,000	0.01	30-130	30-130	0.001	0.0002	30-130	30-130
Indeno(1,2,3-cd)pyrene	0.02	0.62	2.10	0.01	30-140	40-130	0.001	0.0002	30-140	40-130
Naphthalene	0.02	56	190	0.01	30-130	20-130	0.001	0.0002	30-130	20-130
Phenanthrene	0.02	-	-	0.01	30-130	30-130	0.001	0.0002	30-130	30-130
Pyrene	0.02	2,300	29,000	0.01	30-130	10-160	0.001	0.0002	30-130	10-160
Sulfate	5	-	-	2.5	80-120	80-120	0.5	0.25	80-120	80-120
Nitrate	1	-	-	0.5	80-120	80-120	0.1	0.05	80-120	80-120
Nitrite	1	-	-	0.5	80-120	80-120	0.1	0.05	80-120	80-120
Alkalinity as CaCO3, Total	-	-	-	-	80-120	80-120	5	1	80-120	80-120
pH	0.01	-	-	-	-	-	0.01	-	-	-

Table 4-4 Continued

Notes:

1 Project Action Limits

2 Method Detection Limit (MDL) – The lowest concentration that can be reported, while minimizing uncertainty due to matrix effects.

“-“ PRG or MCL not published for the analyte

* PRGs for total xylenes are used

** Based on ambient water quality criteria (AWQC)

Acronyms:

mg/kg – milligram per kilogram

RPD – Relative Percent Difference

LCS – Laboratory Control Sample

MS/MSD – Matrix Spike/Matrix Spike Duplicate

VOCs – Volatile Organic Compounds

EPA - United States Environmental Protection Agency

NA – Not Applicable

TABLE 4-5 (UFP-QAPP WORKSHEET #20)
FIELD QUALITY CONTROL SAMPLE SUMMARY

Matrix	Analytical Group	Analytical and Preparation SOP Reference	Number of Field Duplicates	Number of MS/MSDs	Number of Field Blanks	Number of Equipment Rinsate Blanks	Number of Trip Blanks	Total Number of QC Samples to Lab
Soil	8260B	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	8270C SIM	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	6010B	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	8015M	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	300.0	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	SM 2320B	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Soil	150.1	SOPs T-001, T-003, T-008, and SAP Section 4.2.4 Soil Sampling	0	1/1	1	0	0	3
Water	8260B	N/A	0	0	0	2	2	4
Water	8260C SIM	N/A	0	0	0	2	2	4

(table continues)

Table 4-5 Continued

Matrix	Analytical Group	Analytical and Preparation SOP Reference	Number of Field Duplicates	Number of MS/MSDs	Number of Field Blanks	Number of Equipment Rinsate Blanks	Number of Trip Blanks	Total Number of QC Samples to Lab
Water	6010B	N/A	0	0	0	2	2	4
Water	8015M	N/A	0	0	0	2	2	4
Water	300.0	N/A	0	0	0	2	2	4
Water	SM 2320B	N/A	0	0	0	2	2	4
Water	150.1	N/A	0	0	0	2	2	4

TABLE 4-6 (UFP-QAPP WORKSHEET #12)
MEASUREMENT PERFORMANCE CRITERIA – FIELD QC SAMPLES

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Equipment Rinsate	VOCs (EPA 8260B)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	Metals (EPA 6010B)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	PAHs (EPA 8270C SIM)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	TPH extended range (EPA 8015M)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	Sulfate/Nitrate/Nitrite (EPA 300.0)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	pH (EPA 150.1)	Daily	Precision and Accuracy	20	S&A
Equipment Rinsate	Alkalinity (SM 2320B)	Daily	Precision and Accuracy	20	S&A
Field Blank	VOCs (EPA 8260B)	One per source water	Precision and Accuracy	20	S&A
Field Blank	Metals (EPA 6010B)	One per source water	Precision and Accuracy	20	S&A
Field Blank	PAHs (EPA 8270C SIM)	One per source water	Precision and Accuracy	20	S&A
Field Blank	TPH extended range (EPA 8015M)	One per source water	Precision and Accuracy	20	S&A
Field Blank	Sulfate/Nitrate/Nitrite (EPA 300.0)	One per source water	Precision and Accuracy	20	S&A
Field Blank	pH (EPA 150.1)	One per source water	Precision and Accuracy	20	S&A
Field Blank	Alkalinity (SM 2320B)	One per source water	Precision and Accuracy	20	S&A

TABLE 4-7 (UFP-QAPP WORKSHEET #22)
FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

Field Equipment	Calibration Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
PID	95% Isobutylene	Daily	± 5%	Adjust instrument sensitivity to meet specifications.	Health and Safety Representative.	RBA SOP T-011	According to manufacturer's specifications.
LIF	Quinine Sulfate (Qs10) and Fischer Sea Sand (FSS) control standards	Before and after each push	± 5%	Adjust laser sensitivity to meet specifications.	SCAPS Data Acquisition Specialist	RBA SOP T-005	According to laser manufacturer's specifications.

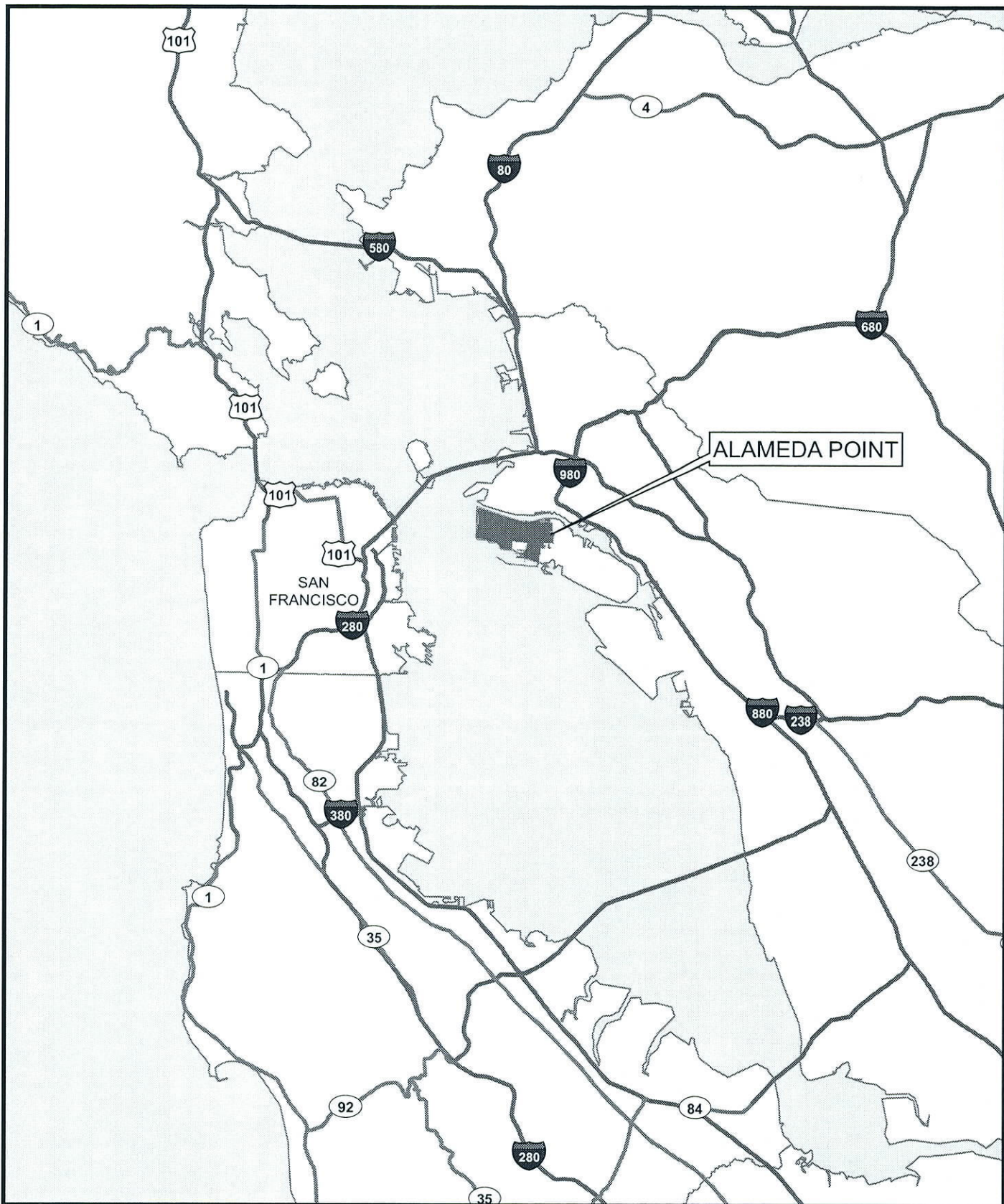
TABLE 4-8 (UFP-QAPP WORKSHEET #29)
PROJECT DOCUMENTS AND RECORDS

Document	Where Maintained
Field notes/logbook	Project file/RBA office
Chain of custody forms	Project file/RBA office
Laboratory raw paper data package	Project file/NAVFAC SW Administrative Records
Audit/assessment checklists/reports	Project file/RBA office and laboratory
Corrective action forms/reports	Project file/RBA office and laboratory
Laboratory equipment calibration logs	Laboratory
Sample preparation logs	Laboratory
Run logs	Laboratory
Sample disposal records	Laboratory
Validated data	Project file/NAVFAC SW Administrative Record

**TABLE 6-1 (UFP-QAPP WORKSHEET #34)
VERIFICATION PROCESS**

Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain-of-custody forms will be reviewed by the project team in the field upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody should be initialed by the reviewer, a copy of the chain-of-custody retained in the project file, and the original and remaining copies taped inside the cooler for shipment.	I	Don McHugh, RBA Project Manager
Upon report completion, a copy of all audit reports will be placed in the project file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the project file. At the beginning of each week, and at the completion of the site work, project file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the project manager will be notified to ensure action is taken.	I	Don McHugh, RBA Project Manager
Field notes will be reviewed internally and placed in the project file. A copy of the field notes will be attached to the final report.	I	Don McHugh, RBA Project Manager
All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in Section 6.1.1 of the SAP.	I, E	Laboratory and data validators

FIGURES



SITE LOCATION MAP

ALAMEDA POINT ALAMEDA, CALIFORNIA

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Engineering and Construction
3710 Ruffin Road
San Diego, California 92123
Telephone 858.496.0500 Fax 858.496.0505

DATE: Oct 16, 2007
FILE: AlaBaseLoc

FIGURE:
1-1

**FIGURE 1-2
PROJECT ORGANIZATION CHART**

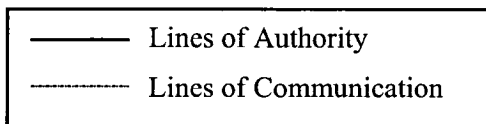
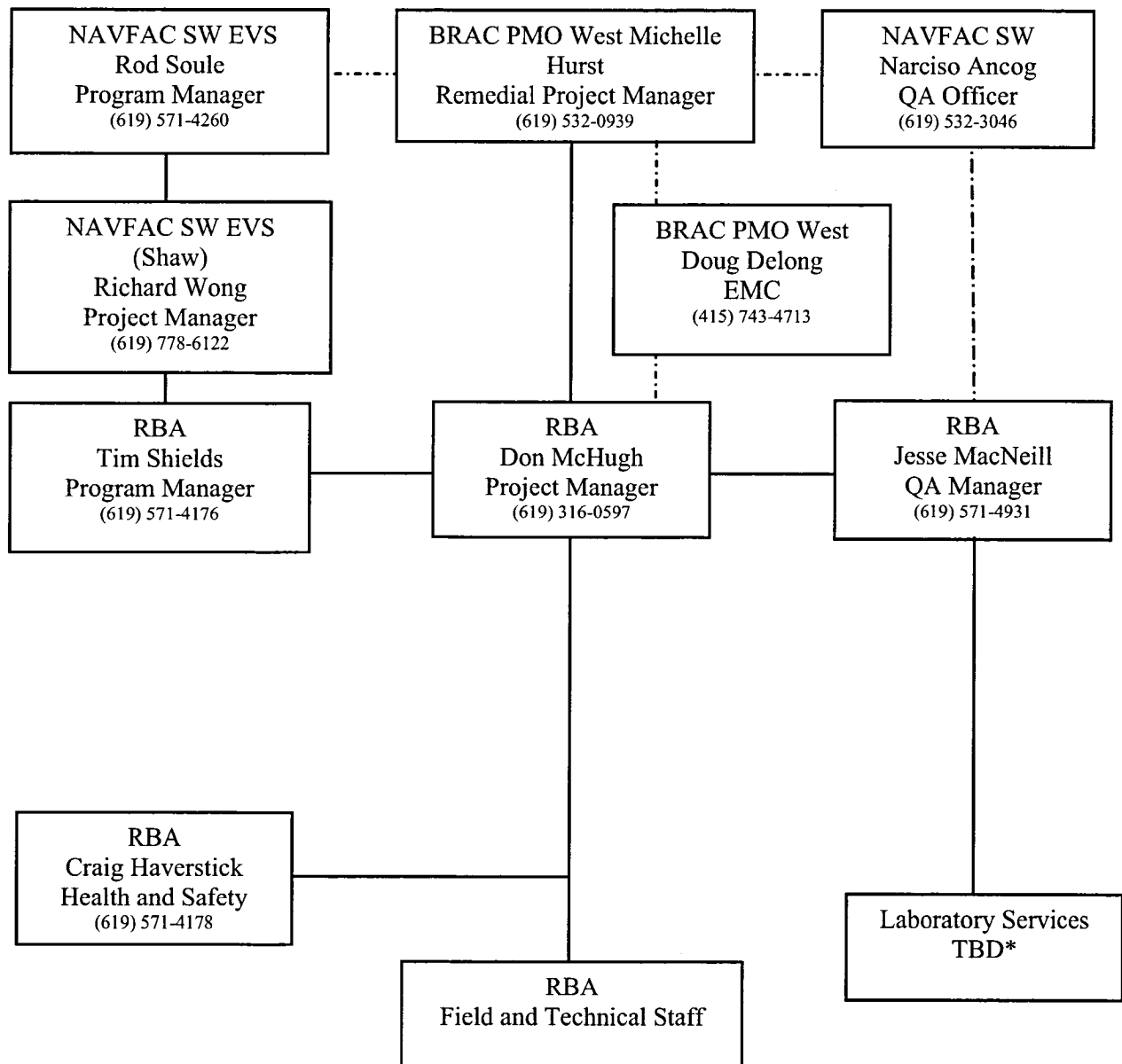
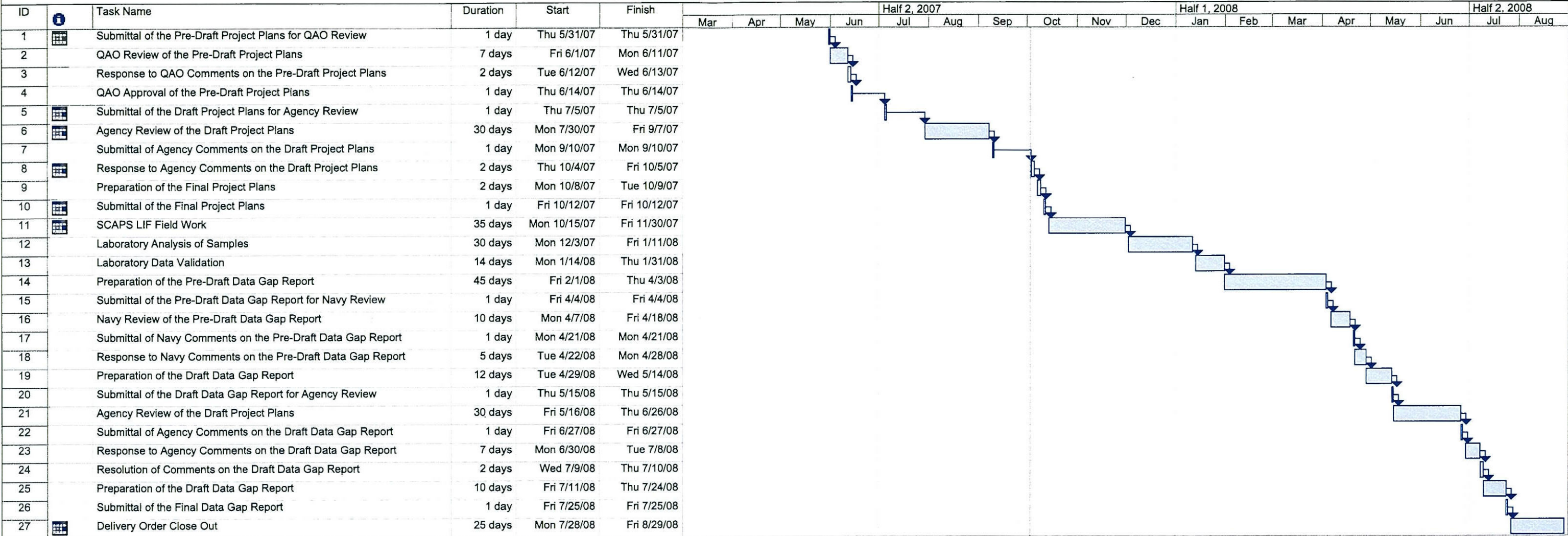
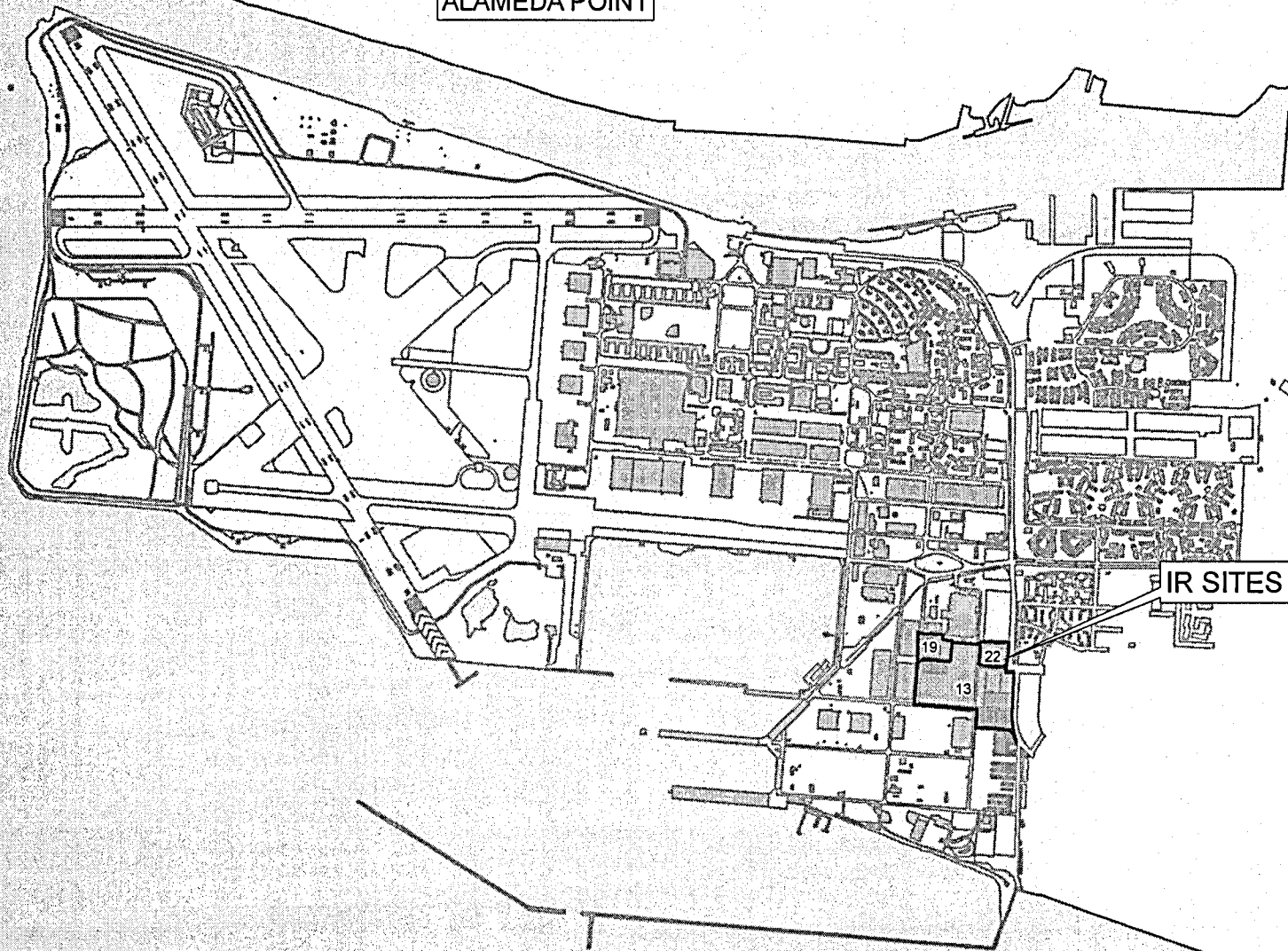


Figure 1-4
Project Schedule SCAPS LIF Investigation
IR Site 13 Alameda Point



ALAMEDA POINT



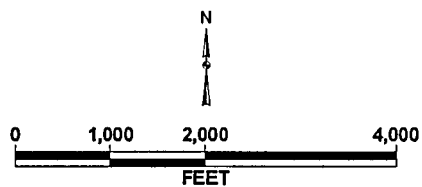
SITE PLAN

ALAMEDA POINT ALAMEDA, CALIFORNIA

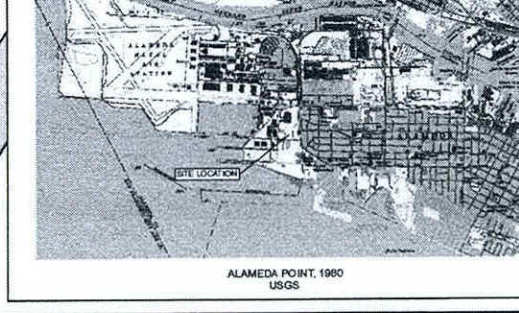
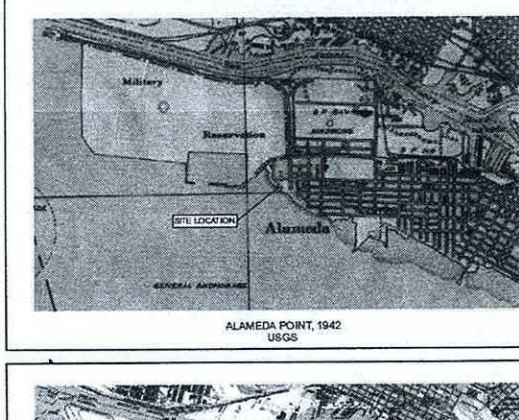
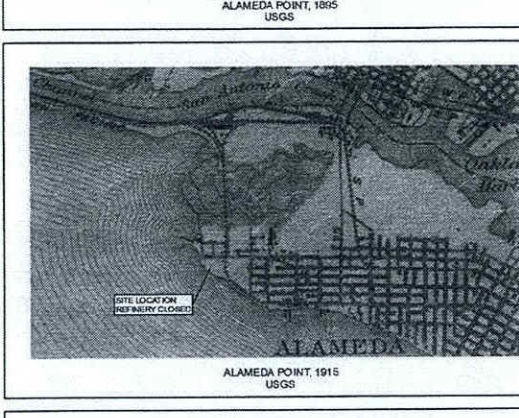
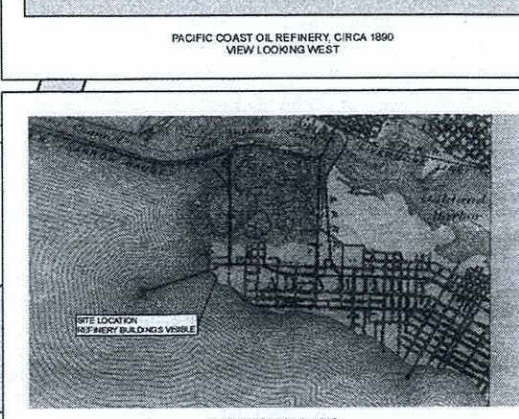
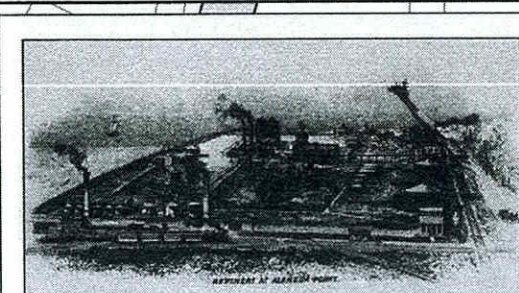
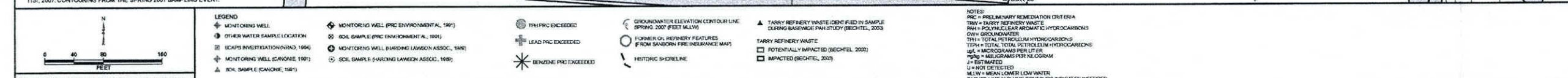
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DATE: Oct 16, 2007
FILE: AlaBaseOv

FIGURE:
2-1

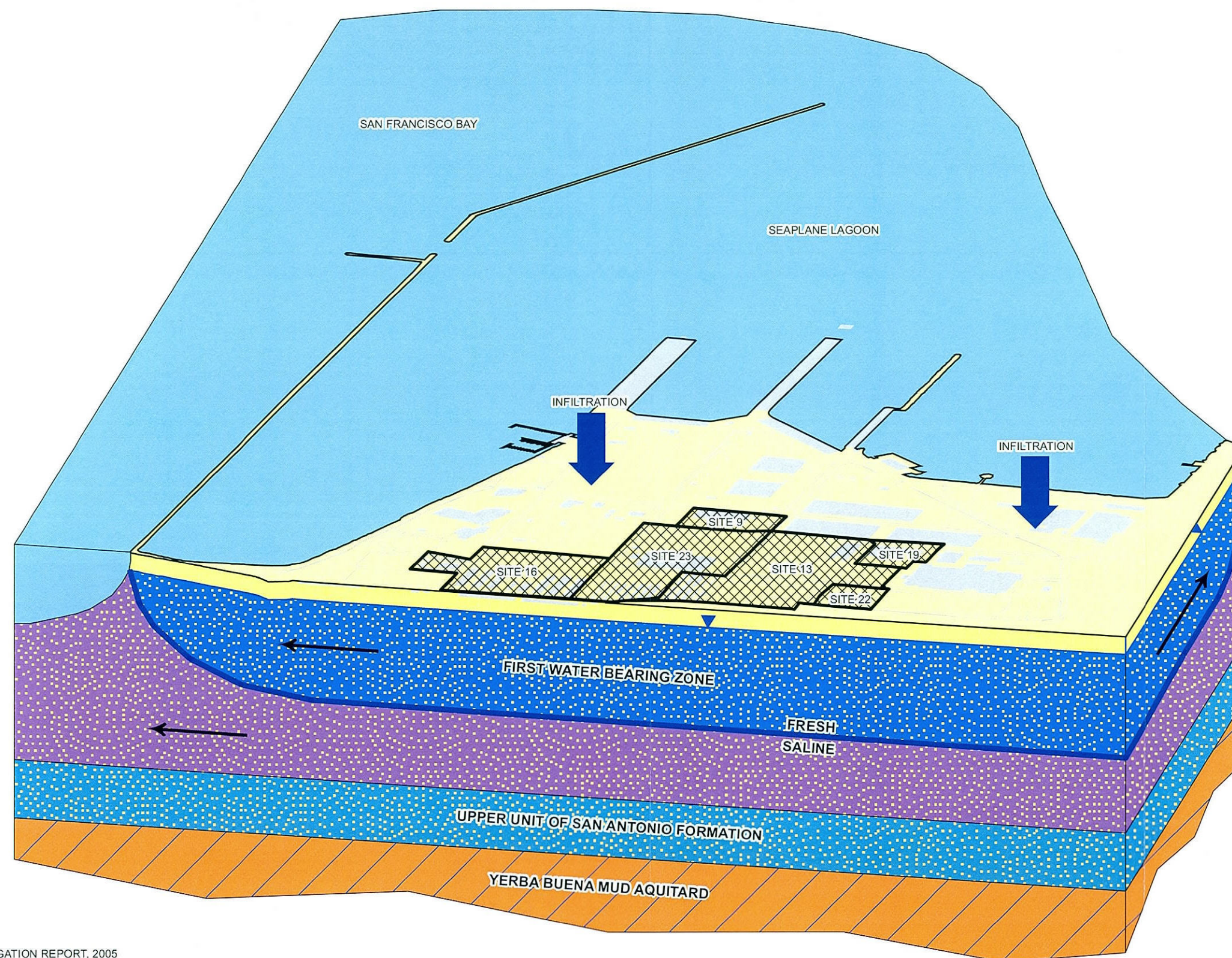


MAP PROJECTION: NAD 27 CALIFORNIA STATE PLANE 3, SURVEY FEET



HISTORIC/CURRENT SITE CONDITIONS		
ALAMEDA POINT ALAMEDA, CALIFORNIA		
<i>Richard Stealy and Associates</i> Engineering & Architecture 2100 Central Expressway San Diego, California 92101 Telephone: (619) 584-1122 Fax: (619) 584-1123 E-mail: rstealy@earthlink.net	DATE: Oct 16, 2007 FILE: A980104 071204	FIGURE 2-1





REFERENCE:
TETRA TECH EM INC. REMEDIAL INVESTIGATION REPORT, 2005
NOT TO SCALE

LEGEND

INSTALLATION RESTORATION SITE

BUILDING

SEAWATER

ARTIFICIAL FILL

MERRITT SAND WITH FRESH WATER

MERRITT SAND WITH SALINE WATER

UPPER UNIT OF SAN ANTONIO FORMATION

YERBA BUENA MUD AQUITARD

CONTACT OF LITHOLOGIC UNITS

FIRST WATER-BEARING ZONE WATER TABLE

GROUNDWATER FLOW DIRECTION

FRESHWATER/SALTWATER INTERFACE
(TOTAL DISSOLVED SOLIDS (TDS) > 10,000 MILLIGRAMS PER LITER (mg/L))

CONCEPTUAL SITE
HYDROGEOLOGIC MODEL

ALAMEDA POINT
ALAMEDA, CALIFORNIA

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DATE: Oct 16, 2007
FILE: AlamConModel

FIGURE:
3-2

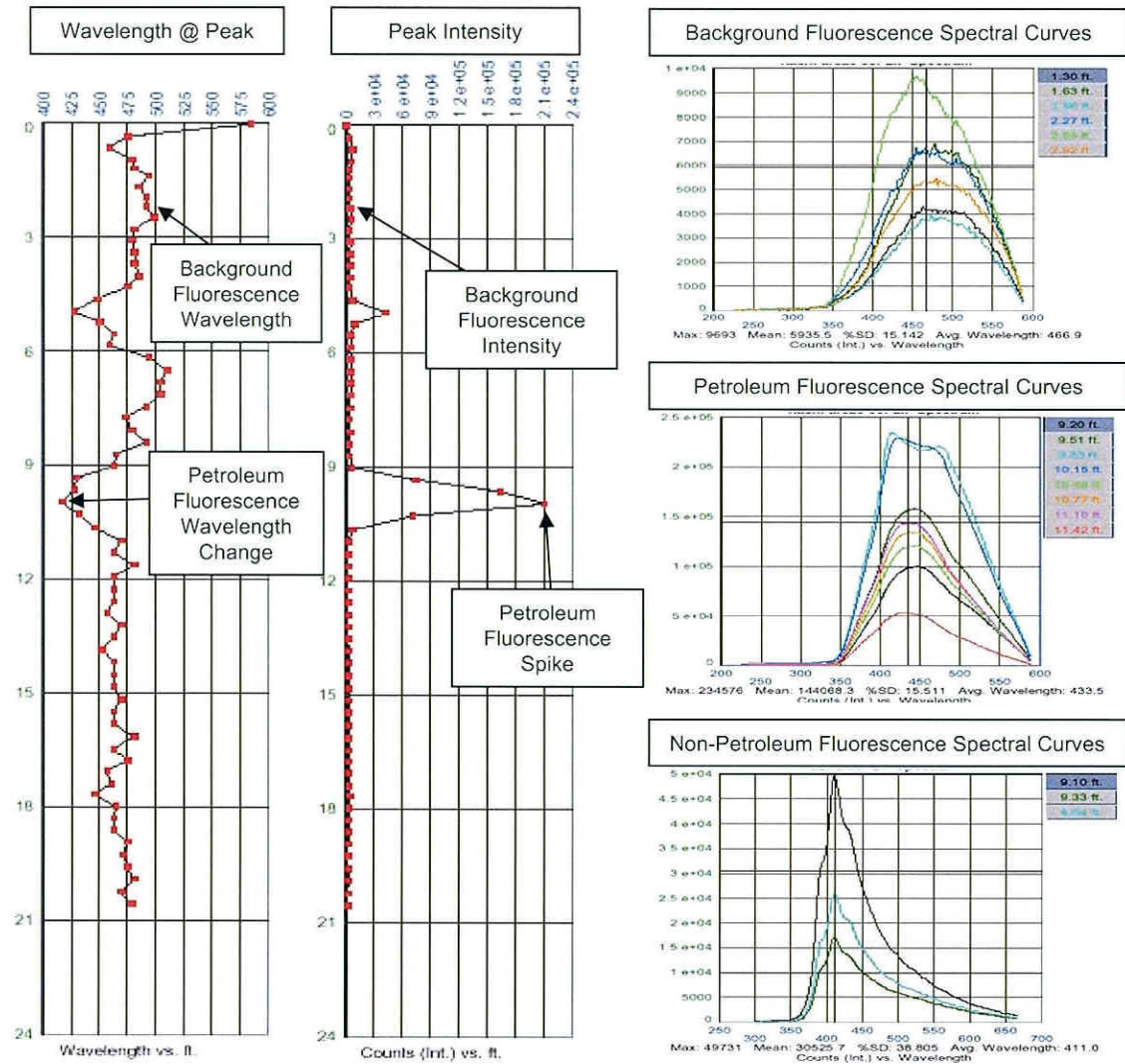
Figure 4-1
LIF Data Interpretation
Factors to Evaluate Petroleum Hydrocarbon Detection by LIF

Primary Factors:

- Increase in Fluorescence Intensity
- Corresponding Change in Fluorescence Wavelength
- Spectral Curve Shape Consistent with Petroleum Hydrocarbon

Secondary Factors:

- Significant Thickness of Interval
- Spatial Location Consistent with Expected Migration Patterns
- Comparison with Sample Analysis



APPENDIX A

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE


EQUIPMENT DECONTAMINATION

SOP NUMBER: T-001

REVISION NUMBER: 0

REVISION DATE: APRIL 27, 2007

Prepared by:  5/3/07
Jason Williams Date

Approved by:  5/2/07
Jesse MacNeill Quality Assurance Manager Date

Approved by:  5/3/2007
Tim Shields - Program Manager Date

Richard Brady & Associates

Engineering and Construction

3710 Ruffin Road
San Diego, CA 92123

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RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION PROCEDURES

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes procedures for field decontamination of drilling and sampling equipment. This SOP provides a description of methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination. This SOP also provides general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations. Implementation of this procedure will help protect site and community personnel by preventing removal of non-decontaminated equipment from a controlled area.

2.0 BACKGROUND

Samples of media such as soil and groundwater, collected during field investigations, are used to evaluate the presence and extent of potential contaminants. All equipment that comes in contact with the sampled material should be free of components that could influence (contaminate) the true physical or chemical composition of the material. Decontamination of the sampling equipment is required to minimize the risk of exposure to hazardous substances, prevent cross-contamination, and ensure the collection of representative samples. Disposable equipment or the use of dedicated equipment provides the most effective means of avoiding cross-contamination; however, the use of such equipment is not always practical. When non-dedicated equipment is used, physical and chemical steps shall be implemented to decontaminate or remove any chemical or material contamination from the sampling equipment.

Equipment shall be decontaminated to a level that meets the minimum requirements of the data collection effort. Decontamination steps (e.g., use of solvents versus use of only soap and water), should be selected based on the constituents present, their concentration levels in the waste or materials sampled, and their potential to introduce bias in the sample analysis results if not removed from the sampling equipment. Project-specific decontamination procedures shall be described in a work plan.

3.0 APPLICABILITY

This procedure is applicable for field decontamination of drilling, excavating, and/or sampling equipment that comes into contact with potentially contaminated soil, water, or other potentially hazardous materials. This procedure is applicable to drill rigs, backhoes, hand-augers, samplers, and other equipment or containers used in sampling.

This procedure may vary or change depending on site conditions, equipment limitations, or limitations imposed by the procedure. Use procedures specified in a site-specific work plan or Health and Safety Plan, where in conflict with or superior to this procedure. In all instances, document actual procedures used in the field log book.

4.0 DEFINITIONS

Decontamination – the removal of contamination from persons or objects.

Container – a portable device, in which a material is stored, transported, treated, disposed of, or otherwise handled.

Cross-Contamination – the inadvertent introduction of contaminated materials from one location to another.

HSP – Health & Safety Plan developed specific for a site or field activity that has been approved by the Site Safety and Health Representative. The HSP provides information specific to the project including relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g. personal protective equipment) and hazard mitigation.

IDW – Investigation Derived Waste.

Field Logbook – Permanent record of field activities. Must be bound. Off site personnel should be able to reconstruct all activities of the field investigation team using the field logbook.

PPE – Personal Protective Equipment.

Residual Contamination – Contamination residue that requires a detergent or solvent solution to remove from equipment, as in a wet decontamination area.

Gross Contamination – Contaminated matter that can be removed from equipment mechanically, as in the dry decontamination area.

Dry Decontamination Area – An optional division of the Decontamination Zone where gross decontamination is removed by physical means without water or solvents.

Wet Decontamination Area – Part of the Decontamination Zone where aqueous detergent and/or solvent solutions are used to remove contamination from equipment.

ACS - American Chemical Society, sets standards for the highest quality of chemical purity; publisher of *Reagent Chemicals*, 9th Edition, a guide to testing chemical purity.

5.0 REFERENCES

NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities [PB85-115/October 1985]

EPA, Office of Emergency and Remedial Response, Standard Operating Safety Guides, [PB9285.1-03/June 1992]

29 Code of Federal Regulations, 1910.132; Personal Protective Equipment Standard
Navy/Marine Corps Installation Restoration Manual, Naval Facilities Engineering Services Command (NFESC), February 1997

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, 1986.

U.S. EPA, "RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment", EPA530-D-02-002, August 2002.

U.S. EPA, "Sampling Equipment Decontamination," SOP Number 2006, August 11, 1994.

California Department of Toxic Substances Control, Hazardous Materials Laboratory, User's Manual, Revision 9, (October 1995).

6.0 APPARATUS AND MATERIALS

See attached equipment and material checklist for equipment and supplies for typical decontamination activities. Some equipment may not be applicable for some projects. Consider equipment based on availability, ease of decontaminating or disposing equipment, and type of contaminants encountered.

7.0 PROCEDURE

Use this procedure to remove or neutralize contaminants from equipment to minimize the likelihood of sample cross contamination, reduce or eliminate transfer of contaminants to clean areas, and prevent the mixing of incompatible substances.

7.1 Responsible Personnel

The following personnel are responsible for activities identified in this procedure.

Project Manager (PM) - is responsible for ensuring that field personnel have been trained in the use of this procedure. The PM is responsible for ensuring that field personnel have the proper equipment and decontamination line established prior to starting any invasive field activities. The PM is also responsible for making arrangements to dispose of all decontamination generated wastes (i.e., liquids and solids) and keeping documentation demonstrating proper disposal of such wastes.

Physical Science Technician (PST) – is responsible for conducting decontamination procedures. The PST is responsible for monitoring and aiding in the decontamination of personnel, PPE, and equipment. The PST must be appropriately protected to accomplish this task without exposure to the contamination. The PST is also responsible for communicating to the PM any problems encountered during the field activities.

7.2 Establish Decontamination Areas

Prior to starting field work, define geographic boundaries where contaminated equipment is restricted and where decontamination activities are performed:

- **Exclusion Zone:** The area where active and invasive activities (i.e. drilling, excavation, sampling, etc) will be undertaken. The zone of maximum hazard for exposure to contaminants.
- **Contamination Reduction Zone:** The decontamination station(s) are located here.
- **Support Zone:** The area that sits outside the Exclusion Zone and the Contamination Reduction Zone, which has minimal hazards from physical activities and chemical contaminants.

7.2.1 Dry Decontamination Area

Remove loose, contaminated soil adhering to the equipment in a dry decontamination area. Remove gross contamination physically without the use of water to reduce the amount of liquid waste. Separate “dry” and “wet” decontamination areas may not be applicable for all project sites. All excess water and loose soil on the drill rigs, augers, pipes, and other equipment should be removed to the maximum extent possible in the exclusion zone, prior to moving into the contamination reduction zone for more thorough cleaning. Using brushes, knock loose soil off flight augers or other sampling equipment onto plastic sheeting, into soil containment vessels, and/or back into the open boring.

7.2.2 Wet Decontamination Area

Remove residual contaminants in a wet decontamination area that were not removed during dry decontamination. For projects utilizing drilling or excavating equipment, use a liquid containment vessel in the wet decontamination area. Use a high-pressure steam cleaner, a pump to transfer liquid wastes, and drums or other containers with liners for storing liquid wastes, as needed. Use secondary containment with drums or containers containing liquid waste.

7.3 Generic Decontamination Procedures

Use these general guidelines for decontamination:

1. Decontaminate reusable equipment before use, between samples, and upon completion of field activities. Do not use/reuse a piece of equipment if it appears discolored or otherwise obviously contaminated.
2. Decontaminate the decontamination workers themselves before they enter a clean or Support Zone.
3. Use only labeled, dispensing devices to disperse water, alcohol, acid, and solvent rinses.
4. Do not clean rubber or plastic surfaces with hexane, methanol, or isopropyl alcohol.
5. Manage contamination wash and rinse solutions and contaminated articles as either hazardous waste or investigation-derived wastes.

Decontaminate equipment using these three general steps:

- 1) Remove gross contaminants.
- 2) Remove residual contaminants.
- 3) Prevent contamination.

7.3.1 Remove Gross Contamination

Remove gross contamination by:

- physical removal (dry decontamination) or
- steam or high-pressure hot water cleaning and/or vigorous brushing with a non-phosphate detergent or
- soaking and brushing.

Consider the type of equipment being decontaminated (e.g., drilling tools or electronic equipment) and the contaminating medium.

7.3.2 Remove Residual Contamination

Use this generic procedure for removing residual contamination as recommended by U.S. EPA, Region IX.

Set up a decontamination line in sequential order, over a plastic drop cloth.

1. Wash equipment with a low or non-phosphate detergent.
2. Rinse with potable water.
3. Rinse with de-ionized or distilled water.

7.3.3 Prevent Recontamination after Decontamination

After decontamination, protect equipment from further contamination. Protection measures include wrapping with oil-free aluminum foil or plastic, and storing in Ziploc bags.

7.3.4 Disposal of Contaminants

Manage gross contamination and all washing and rinsing solutions as investigative derived waste (IDW). After use, manage gloves and other contaminated personal protective equipment as IDW.

8.0 SPECIFIC DECONTAMINATION PROCEDURES

8.1 Decontamination of Field Instruments

Field instruments such as organic vapor monitors and gas analyzers are typically not constructed to allow immersion or aggressive scrubbing. Care should be taken to minimize the exposure to solid or liquid contaminants. In environments with high potential for contamination, instruments may be operated in plastic bags, allowing only detector assemblies to be exposed. Manufacturer instructions should be consulted. Probes of pH, temperature, and specific conductance meters should be thoroughly washed with deionized or distilled water then rinsed with deionized water.

8.2 Drilling/Excavation Equipment Decontamination

This section applies to drilling equipment and other hardware that goes down a borehole, including drill pipe, augers, drill bits. Decontaminate vehicles and downhole drilling equipment prior to moving to a site, between each drilling location, and prior to leaving the site. Decontamination of drilling equipment shall be performed by the drilling subcontractor.

Drill rig vehicle decontamination should be conducted on decontamination pads or in designated decontamination areas located close enough to the work site that contamination is not spread during the movement of the vehicle. Decontamination of drilling/excavating equipment shall be conducted in general accordance with the following steps:

- 1) Remove coarse soil adhered to equipment with a steel brush or equivalent instrument in dry decontamination area and/or in exclusion zone.
- 2) Move equipment to rack in the wet decontamination area (contaminant reduction zone).
- 3) Wash with a high pressure steam cleaner.
- 4) Air dry.

- 5) Protect decontaminated drilling and excavating equipment not in active use, such as hollow-stem auger sections, drill rods, down-hole hammers and bits, from dirt and dust until needed.
- 6) Remove soil from dry decontamination area and place in designated containers or disposal area.
- 7) Remove liquid from decontamination vessel and place in designated containers.
- 8) Dispose rags, plastic, PPE, etc., in designated container.
- 9) Secure decontamination area daily.

8.3 Decontamination of Soil and Sediment Sampling Equipment

Soil and sediment sampling equipment includes sample barrels, sleeves (i.e. tube, liners), retainers, hand augers, trowels, spoons, corers, grab samplers, dredges, and any other objects that might come into contact with a soil or sediment sample in the course of its collection and handling. Decontaminate before each use, and before departing the field. Decontaminate sample collection and sample preparation equipment used for soil sampling as follows:

- 1) Place equipment on a sawhorse or rack for inspection and decontamination in dry decontamination area and/or contaminant reduction zone.
- 2) Remove coarse soil adhered to equipment with a steel brush. Remove more cohesive material from equipment with a flat scraper such as a wooden spatula. A water spray bottle may be used to lightly moisten dry soil being removed from the equipment, if needed to control dust. Only the minimum amount of water spray should be used to keep the waste moisture content low.
- 3) Move equipment to wet decontamination area (if a separate dry decontamination area is used).
- 4) Scrub equipment in a containment vessel with a low or non-phosphate detergent.
- 5) Rinse in a containment vessel with potable tap water.
- 6) Rinse in a containment vessel with distilled or deionized water.
- 7) Air dry.
- 8) Protect decontaminated equipment from recontamination by dust, spray, and airborne contaminants by aluminum foil and/or plastic wrap and segregate from contaminated equipment until needed.
- 9) Sample preparation equipment used to collect sub-samples that will constitute a single composite sample does not need to be decontaminated between each sub-sample collection.

- 10) If the rinsate in the liquid containment vessel includes methanol, it should be kept separate from methanol-free waste to minimize cross-contamination and mixed waste. Do not overfill drums to allow for expansion. Methanol-soaked rags or towelettes should be bagged and placed into a separate lined drum.
- 11) Remove soil from dry decontamination area and place in designated containers or disposal area.
- 12) Remove liquid from decontamination vessel and place in designated containers.
- 13) Dispose rags, plastic, PPE, etc., in designated container.
- 14) Secure decontamination area daily.

8.4 Decontamination of Groundwater Sampling Equipment

Groundwater sampling equipment includes bailers, well sounder tapes, water level indicators, interface probes, pumps, hoses and wires introduced into the well, bailers, filters, and any other objects that might come into contact with groundwater that might be sampled. Gross contamination is typically not a problem unless viscous non-aqueous-phase liquids (NAPL) have accumulated.

Avoid introducing gross contaminants to wells. Tapes, hoses, and wires should not be permitted to lie on the ground or on contaminated surfaces. If such items become contaminated by ground contact, decontaminate prior to use. Equipment may be protected by hose reels, plastic sheeting, or plastic tubs.

Rinse or wipe equipment prior to inserting into wells, and when removed from wells. Manufactures instructions shall be consulted for decontamination of pumps and interface probes. NOTE: Certain materials may be susceptible to damage from organic solvents and/or acidic solutions.

Decontaminate water-sampling equipment by:

1. To decontaminate well casings/screens, prior to installation:
 - scrub with a laboratory grade detergent/water solution and
 - rinse with tap water or potable water.

NOTE: In the case that the well casings/screens are obtained in a previously sealed plastic wrapping from the manufacturer, there is no need to decontaminate.
2. To decontaminate water level measurement devices:
 - scrub with a laboratory grade detergent/water solution and
 - rinse with tap water or potable water.
 - Avoid organic solvents which can remove the numbers from the tape.

3. To decontaminate well purging apparatus; bailers, pumps, and hand-held tools:
 - scrub with a laboratory-grade detergent/water solution,
 - rinse with tap or potable water, then
 - rinse with deionized-grade water, and
 - allow to air dry between uses.
4. Wrap hand-held equipment in aluminum foil or plastic to prevent contamination by airborne contaminants during transportation to the sampling site.

9.0 PERSONAL PROTECTIVE EQUIPMENT

9.1 Personal Protective Equipment Requirements

Personnel in potential contact with known or suspected hazardous substances contamination must wear protective equipment. The types and levels of PPE and the procedures for decontaminating personnel upon leaving a contaminated zone are beyond the scope of this SOP. The purpose of PPE is to protect field personnel. PPE may be effective in protecting personnel from chemical hazards, but could compromise the usefulness of media samples if inadequately decontaminated between samples.

- Avoid contact with media samples.
- Use disposable gloves. Replace with fresh gloves for each sample.
- Decontaminate PPE using the same procedures for sampling equipment.

10.0 DOCUMENTATION

Document decontamination activities daily in the field logbook. Describe any deviations in procedures or conditions and/or problems that occur. The PST shall be responsible for submitting completed, legible copies of the field logbook to the Project Manager for review. The Project Manager shall be responsible for maintaining the logbook.

RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

ATTACHMENT 1

EQUIPMENT AND SUPPLY CHECKLIST

EQUIPMENT AND SUPPLY CHECKLIST

Work Plan

Low or non-phosphate laboratory detergent such as Alconox™ or Liquinox™ or equivalent. Liquinox is the preferred detergent.

Sodium Hypochlorite, (bleach, i.e., Clorox).

Disinfectant, (EPA registered biocide).

Selected Rinses and Solvent Rinses (U.S. EPA, 1994)

Solvent	Examples of Solvent Rinse	Soluble Contaminant
Water	Deionized Water - Recommended maximum conductivity 1 μ S/cm. Tap Water - From an approved source with known chemistry	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	1:1 Hydrochloric Acid - ACS trace element grade (5 percent by volume) 1:1 Nitric Acid - ACS trace element grade (10 percent by volume)	Nutrients Metals, Basic (caustic compounds (e.g., amines and hydrazines)
Organic Solvents	Hexane –pesticide grade	Organics (heavily contaminated), PCBs
Organic Solvents	Acetone - Pesticide-grade Isopropanol – Pesticide grade Methanol	Organics

Decontamination Tools and Supplies

High-pressure portable steam cleaner.

Liquid containment vessel and support rack.

Solids containment vessel and support rack.

Shovel.

Electrical generator (if power source is not available) and fuel.

Power cord (to connect steam cleaner to generator).

Sturdy equipment table for tool assembly and disassembly.

Stool or chair.

Portable liquids pump and 10-foot (minimum) discharge hose.

Bottlebrush.

Long handled steel and soft bristled scrub brushes.

Heavy plastic sheeting/drop cloths.

Plastic or galvanized containers, buckets or tubs to hold wash and rinse solutions.

Non-reactive solvent sprayers.

Paper or clothe towels.
Aluminum foil.
Plastic wrap.
Bound field logbook and ink pens.
Labels and marking pens.
Saw horses or racks for drill stem and other drilling hardware.

Waste Disposal

Plastic trash bags.
55-gallon drums.
Trash containers.
Trash liners.
Metal/plastic buckets/containers for storage and disposal of decontamination solutions.
Wooden pallets (for drums).
Secondary containment for drums containing liquid.

Health and Safety Equipment

Chemical-resistant safety glasses, goggles, or splash shield.
Chemical-resistant disposable clothing (i.e., Tyvek, coated-Tyvek, Saranex, etc.).
Chemical-resistant gloves (i.e., natural rubber, nitrile, latex, etc.).
Duct tape.
Air Purifying Respirators, equipped with organic vapor cartridges.
Any additional PPE, as required.
Portable emergency eyewash station (if one is not available within 50 feet).
First Aid Kit.


STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE FOR VOLATILE ORGANICS USING THE En Core[®] SAMPLER

SOP NUMBER: T-003

REVISION NUMBER: 0


REVISION DATE: APRIL 27, 2007

Prepared by: 
Jason Williams

5/29/2007
Date

Reviewed by: 
Jesse MacNeill - Quality Assurance Manager

5/29/07
Date

Approved By: 
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5/30/07
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RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE FOR VOLATILE ORGANICS
USING THE En Core® SAMPLER

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes a procedure for collecting soil samples for volatile organic compounds (VOCs) using the En Core® Sampler. The outlined procedure is based on the EPA Method 5035 methodology presented in Update III of SW-846 promulgated in June 1997 and may be used in conjunction with analytical determinations of volatile organics including EPA Method 8015 Modified (gasoline fraction only), 8021A, and 8260B.

EPA Method 5035 addresses four on-site handling options from which to select. This SOP focuses on the collection of soil samples for VOC analyses using a headspace-free, gas-tight sampler known as the En Core® Sampler. This SOP is not intended to replace thorough training and reading of reference materials

2.0 BACKGROUND

Collection and storage of soils for VOC analyses using previous EPA methodology (EPA Method 5030) has shown to be inadequate. The primary reasons are the loss of volatiles in the sampling and sub-sampling stages, and microbial degradation of aromatic volatiles. The methodology presented in EPA Method 5035 was designed to minimize VOC losses through volatilization and biodegradation. To address these problems and minimize the loss of VOCs during sample handling stages, EPA Method 5035 includes provisions such as field-preservation or the use of an En Core® Sampler designed to store and transfer soils (no field preservation required) with minimal loss of VOCs.

The En Core® Sampler can be used as applicable (cohesive granular soils) to collect and store samples without preservation for a maximum of 48 hours. A minimum of three En Core® Samplers per location is required to determine whether the concentration is high- or low-level, and to cover the potential for low-level and high-level contamination. Moisture content (so VOC results can be reported on a dry-weight basis) can be determined from unpreserved samples and may be collected from the conventional sample sleeve. The En Core® Sampler is a single use device.

3.0 APPLICABILITY

The procedures presented in this SOP are applicable to field investigation activities involving soil sample collection for VOC analyses. If needed, other methods of field preservation are covered under EPA method 5035. The other methods are not covered in this SOP.

Prior to determining the most appropriate VOC sample collection and preservation method, it is important to gather information regarding the type of soil to be sampled. If this information is not available, the project Sampling and Analysis Plan (SAP) should address all potential available methods of sample collection and preservation to minimize the loss of VOCs during sampling activities. In this case, field personnel should be prepared to perform any of the potential methods.

- Cohesive Granular Soils– The En Core® Sampler should be used on sites where cohesive soils are anticipated or known to occur. This sample collection and preservation method is preferable since it eliminates weighting and the addition of preservation in the field. In this case, samples must be stored at 4°C and prepared for analysis within 48 hours of sample collection.
- Non-cohesive Granular Soils– If gravel or a mixture of gravel and fines cannot be transferred using the En Core® Sampler, the soil may be quickly sampled using a stainless steel spatula or scoop and placed in a sealed VOC vial and analyzed as soon as possible. In this case, it is recommended to use a mobile laboratory to analyze samples as soon as they are collected. Caution should be taken in the interpretation of these results since loss of VOCs is likely due to the sampling method and the non-cohesive nature of the soil being sampled.
- Cemented Soil– If the soil requiring sampling is cemented in a manner that the En Core® Sampler can not be used, subsamples of the soil may be sampled by fragmenting a larger portion of the material using a clean spatula or chisel to generate a fragment that can be placed in a VOC vial. Care should be taken when transferring the aggregate to the sample container to prevent compromising the sealing surfaces and threads of the container. Caution should be taken in the interpretation of these results since loss of VOCs may occur during generation of the aggregate sample.

4.0 DEFINITIONS

Accuracy – The degree of agreement between an observed value and a true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Action Levels – The numerical value specified that causes the decision maker to choose one of the alternative actions (e.g., compliance or noncompliance). It may be a regulatory threshold standard, such as a Maximum Contamination Level, a risk-based concentration level, a technological limitation, or a reference-based standard. The action level is specified during the planning phase of a data collection activity.

Analyte - A chemical component of a sample to be determined or measured.

Bias – The systematic or persistent distortion of a measurement process which causes errors in one direction (i.e., the expected sample measurement is different than the sample's true value).

Cohesive Soil – Soil that possess some resistance to deformation because of the surface tension present in the water films. For example, wet clays can be molded into various shapes without breaking and will retain these shapes. Gravels or a mixture of gravel and fines that can not be easily obtained or transferred using coring tools are not cohesive and are called non-cohesive.

Contaminant of Potential Concern - Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil.

Data Quality Objectives – Qualitative and quantitative statements derived from the DQO process that clarify study objectives, define the appropriate type of data to collect, determine the most appropriate conditions from which to collect data, and specify the tolerable probabilities of making a decision error. These statements are used as the basis for establishing the type, quality, and quantity of data needed to support decisions.

Matrix Spike (MS) - An aliquot sample with known quantities of compounds (target analytes) that is mixed with a field sample and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The sample provides information on the target analyte stability and loss due to matrix interference and volatility after collection and during transport, storage, sample preparation and analysis.

Matrix Spike Duplicate (MSD) - A second aliquot of the same compounds as the matrix spike that is spiked into a duplicate field sample in order to verify the precision and accuracy of the results of the matrix spike.

Sampling – The process of obtaining samples and/or measurements of a subset of population units from the population. Proper sampling techniques must be employed to obtain samples that are representative of actual site conditions.

Target Analyte – The element, compound, or class of compounds detected and quantitated through the analytical measurement process.

Test Method – An adoption of a scientific technique for a specific measurement problem, as documented in a SOP.

Volatile Organic Compounds – Chemicals that have a low boiling point, evaporate easily, and contain hydrogen (H), carbon (C), and possibly other elements.

5.0 REFERENCES

Naval Facilities Engineering Service Center (NFESC), 1999, Navy Installation Restoration Chemical Data Quality Manual, September.

United States Environmental Protection Agency (EPA), 1997, Test Methods for Evaluation Solid Wastes, SW-846, Update III.

United States Environmental Protection Agency (EPA), 1999 Memorandum, Regional Interim Policy for Determination of Volatile Organic Compound (VOC) Concentrations in Soil and Solid Matrices.

United States Environmental Protection Agency (EPA), 1994, Guidance for The Data Quality Objectives Process, USEPA QA/G-4

6.0 APPARATUS AND MATERIALS

- Stainless steel spatula, scoop or knife.
- En Core® Sampler T-Handle and/or En Core® Sampler Extrusion Tool.
- Disposable En Core® Sampler and En Core® Sampler bag (labeled zipbag).
- Decontamination supplies, including a plastic tarp.
- Ice chest and wet ice (double bagged).
- Paper towel.
- Field Logbook.
- Soil Sample Collection Log forms.
- Chain-of-custody forms; sample labels, and custody seals.

7.0 PROCEDURE

This procedure addresses the specific activities to collect soil samples for VOC analyses (any volatile organic compound). The sampling protocol described below focuses on the use of a coring device (En Core® Sampler) that also serves as a shipping container.

7.1 Review of SAP or Work Plan

In preparation for a sampling effort involving the collection of soil samples for VOC analyses (TPH-gasoline and/or VOCs) at a given site, the Project Manager shall meet with the designated field personnel in charge of collecting the samples to review the site SAP and convey the following information:

- Access requirements (e.g., permission of owner, locked gates, road conditions).
- Identification number(s) of the areas to be sampled.
- Specific sample locations and sample identification strategy.
- Soil type being sampled, if known and any special considerations.
- Selected VOC sampling procedure (En Core® Sampler versus preservation).
- The potential use of a mobile lab (instant on-site analyses) and selection of confirmation samples using an En Core® Sampler to the fixed-based laboratory.
- Anticipated number of environmental samples and QC samples to meet project DQOs.
- Sample volume requirements (5 grams versus 25 grams) and/or En Core® Samplers needed by the contracted laboratory. The 25-gram sampler is typically used when Toxicity Characteristic Leaching Procedure (TCLP) and other leaching tests [i.e., synthetic precipitation leaching procedure (SPLP) and waste extraction test (WET)] are required.
- Required Field Logbook entries and any supporting documentation.
- Type of equipment needed for the scheduled sampling activity.

7.2 Sample Collection

The following procedure is designed to provide detailed information in the collection of soil samples using the En Core® Sampler. For a diagram of the sampling device, refer to the Manufacturer's Instructions (Attachment 1)

1. Label all sample pouches with the sample identification scheme indicated in the SAP.
2. Before taking the samples, hold coring device and push the plunger rod down until small o-ring rests against tabs. Depress the locking lever and place coring body plunger end first, into open end of T-handle, aligning the slots on the coring body with the locking pins in the T-handle. Twist coring body clockwise to lock pins in slots. Make sure sampler is locked in place.
3. Immediately before sampling, remove approximately half inch of soil from the exposed surface soil with a clean spatula, scoop, or knife. When inserting a clean coring tool into a fresh surface for sample collection, air should not be trapped behind the sample. This procedure will ensure that a fresh exposed surface is sampled.
4. Turn the T-Handle with the T up and coring down. Using the T-Handle, push sampler into soil until coring body is completely full. The coring body will be full when the small o-ring is centered in the T-Handle viewing hole. Remove sampler from soil sleeve and quickly wipe the coring body exterior to ensure a tight seal.
5. Cap the coring body while it is still on T-Handle. Push and twist cap over bottom until grooves on locking arms seat over ridge on coring body. Cap must be sealed to seal sampler.
6. Remove the capped sampler by depressing locking lever on the T-Handle while twisting and pulling sampler from T-Handle. Lock plunger by rotating extended plunger rod fully counterclockwise until wings rest firmly against tabs.
7. Insert the sampler into the sealable/labeled pouch and immediately place samples in a cooled (4°C) ice chest.
8. Collect field QC samples in accordance with the SAP requirements. A minimum of 3 En Core® Samplers are needed for each sample. A total of 9 En Core® Samplers are needed if collecting sample for MS/MSD.

9. Samples must be analyzed or frozen within 48 hours. Samples that are frozen shall be analyzed within 7 days to meet holding time requirements. Sampler should not be frozen below -20°C due to potential problems with tool seals and the loss of VOCs upon sample thawing.
10. Record laboratory and field identification numbers in the Soil Sample Collection form. Chain of custody forms will be completed with the laboratory identification number only so QC samples are submitted "blind" to the laboratory. .

8.0 DOCUMENTATION

Document all procedures and equipment used during soil sampling in the Field Logbook or appropriate soil sample collection form. Recorded field data shall include:

- Soil type and any relevant visual observations (i.e., stains).
- Inability to collect a representative sample.
- Sample collection date and times.
- Any observation that may impact data interpretation.

9.0 ATTACHEMENTS

1 - En Core® Sampler Manufacturer's Instructions

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STANDARD OPERATING PROCEDURE

ATTACHMENT 1

En Core® Sampler Manufacturer's Instructions

Disposable En Core® Sampler



En Novative Technologies, Inc.

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Green Bay, WI 54302

Phone: 920-465-3960 • Fax: 920-465-3963

Toll Free: 888-411-0757

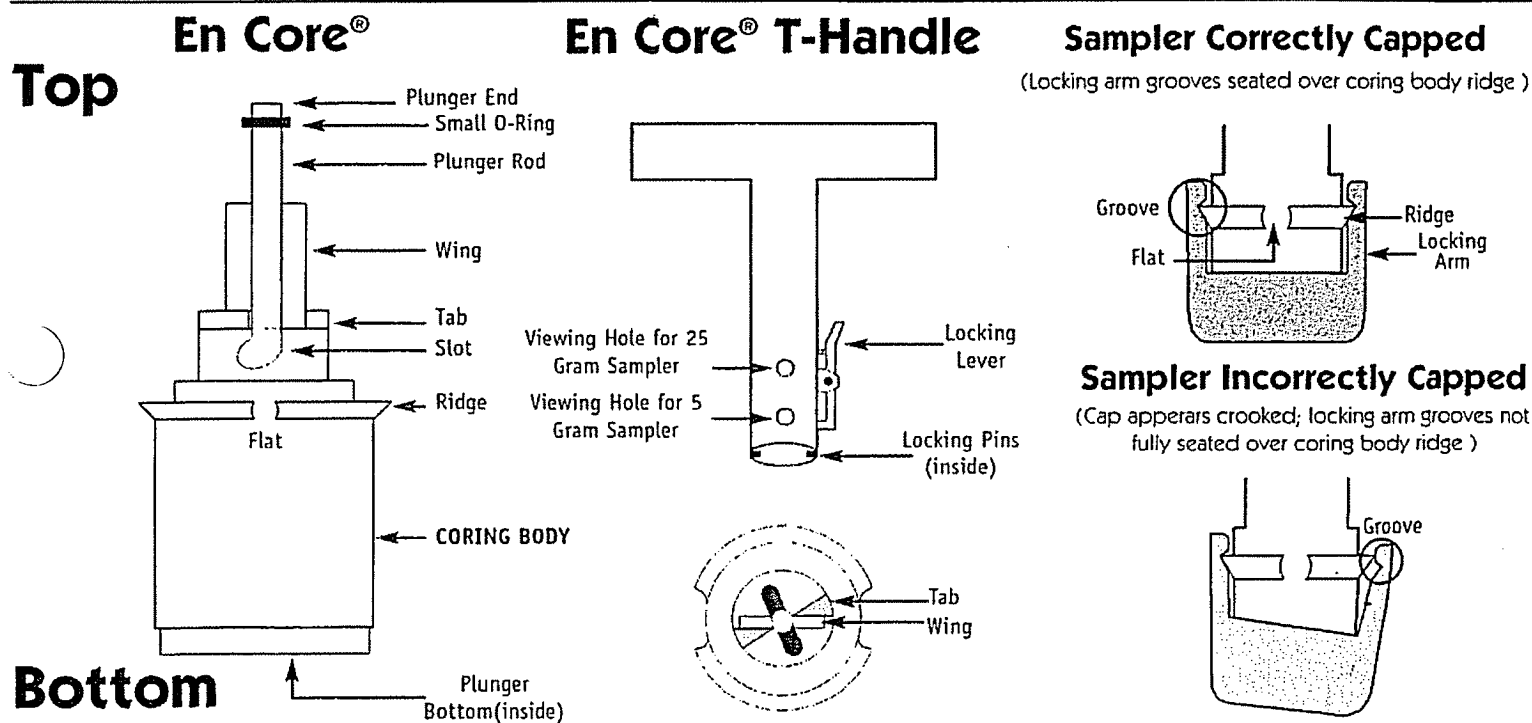
www.ennovativetech.com

NOTE:

1. En Core® Sampler is a SINGLE USE device. It cannot be cleaned and/or reused.
2. En Core® Sampler is designed to store soil. Do not use En Core Sampler to store solvent or free product!
3. En Core® Sampler must be used with En Core® T-Handle and/or En Core® Extrusion Tool exclusively. (These items are sold separately.)

Sampling Procedures

Using The En Core® T-Handle



BEFORE TAKING SAMPLE:

1. Hold coring body and push plunger rod down until small o-ring rests against tabs. This will assure that plunger moves freely.
2. Depress locking lever on En Core T-Handle. Place coring body, plunger end first, into open end of T-Handle, aligning the (2) slots on the coring body with the (2) locking pins in the T-Handle. Twist coring body clockwise to lock pins in slots. Check to ensure Sampler is locked in place. Sampler is ready for use.

TAKING SAMPLE:

Turn T-Handle with T-up and coring body down. This positions plunger bottom flush with bottom of coring body (ensure that plunger bottom is in position). Using T-Handle, push Sampler into soil until coring body is completely full. When full, small o-ring will be centered in T-Handle viewing hole. Remove Sampler from soil. Wipe excess soil from coring body exterior.

4. Cap coring body while it is still on T-handle. Push cap over flat area of ridge and twist to lock cap in place. **CAP MUST BE SEATED TO SEAL SAMPLER** (see diagram).

PREPARING SAMPLER FOR SHIPMENT:

5. Remove the capped Sampler by depressing locking lever on T-Handle while twisting and pulling Sampler from T-Handle
6. Lock plunger by rotating extended plunger rod fully counter-clockwise until wings rest firmly against tabs (see plunger diagram)
7. Attach completed tear-off label (from En Core Sampler bag) to cap on coring body.
8. Return full En Core Sampler to zipper bag. Seal bag and put on ice.

Disposable EnCore® Sampler

EXTRUSION PROCEDURES

USING THE EnCore® EXTRUSION TOOL

CAUTION! Always use the Extrusion Tool to extrude soil from the En Core Sampler. If the Extrusion Tool is not used, the Sampler may fragment, causing injury.

1. Use a pliers to break locking arms on cap of En Core Sampler. Do not remove cap at this time. (CAUTION: Broken edges will be sharp.)
2. To attach En Core Sampler to En Core Extrusion Tool: Depress locking lever on Extrusion Tool and place Sampler, plunger end first, into open end of Extrusion Tool, aligning slots on coring body with pins in Extrusion Tool. Turn coring body clockwise until it locks into place. Release locking lever.
3. Rotate and gently push Extrusion Tool plunger knob clockwise until plunger slides over wings of coring body. (When properly positioned plunger will not rotate further.)
4. Hold Extrusion Tool with capped Sampler pointed upward so soil does not fall out when cap is removed. To release soil core, remove cap from Sampler and push down on plunger knob of En Core Extrusion Tool. Remove and properly dispose of En Core Sampler.

Warranty and Disclaimers

IMPORTANT: FAILURE TO USE THE EN CORE SAMPLER IN COMPLIANCE WITH THE WRITTEN INSTRUCTIONS PROVIDED HEREIN VOIDS ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

PRINCIPLE OF USE. The En Core Sampler Cartridge System is a volumetric sampling system designed to collect, store and deliver a soil sample. The En Core Sampler comes in two sizes for sample volumes of approximately 25 or 5 grams. There are four components: the cartridge with a movable plunger; a cap with two locking arms; a T-handle (purchased separately); and an extrusion handle (purchased separately). NOTE: The En Core Sampler is designed to store soil. It is not designed to store solvent or free product.

The soil is stored in a sealed headspace-free state. The seals are achieved by three special Viton® o-rings, two located on the plunger and one on the cap of the Sampler. At no time and under no condition should these o-rings be removed or disturbed.

QUALITY CONTROL. The cartridge is sealed in an airtight package to prevent contamination prior to use. Due to the stringent quality control requirements associated with the use of this system, the disposable cartridge is designed to be used only once.

WARRANTY. En Novative Technologies, Inc. ("En Novative Technologies") warrants that the En Core Sampler shall perform consistent with the research conducted under En Novative Technologies' approval, within thirty (30) days from the date of delivery, provided that the Customer gives En Novative Technologies prompt notice of any defect or failure to perform and satisfactory proof thereof. THIS WARRANTY DOES NOT APPLY TO THE FOLLOWING, AS SOLELY DETERMINED BY EN NOVATIVE TECHNOLOGIES: (a) Damage caused by accident, abuse, mishandling or dropping; (b) Samplers that have been opened, taken apart or mishandled; (c) Samplers not used in accordance with the directions; and (d) Damages exceeding the cost of the sampler. Seller warrants that all En Core Samplers shall be free from defects in title. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY INFORMATION PROVIDED BY SALES REPRESENTATIVES OR IN MARKETING LITERATURE. IMPLIED WARRANTIES OF FITNESS AND MERCHANTABILITY SHALL NOT APPLY. En Novative Technologies' warranty obligations and Customer's remedies, except as to title, are solely and exclusively as stated herein.

LIMITATION OF LIABILITY. IN NO EVENT SHALL EN NOVATIVE TECHNOLOGIES

BE LIABLE FOR ANTICIPATED PROFITS, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF INCOME, DOWNTIME, REMEDIATION ACTIVITIES, REMOBILIZATION OR RESAMPLING, COST OF CAPITAL, SERVICE INTERRUPTION OR FAILURE OF SUPPLY, LIABILITY OF CUSTOMER TO A THIRD PARTY, OR FOR LABOR, OVERHEAD, TRANSPORTATION, SUBSTITUTE SUPPLY SOURCES OR ANY OTHER EXPENSE. DAMAGE OR LOSS, INCLUDING PERSONAL INJURY OR PROPERTY DAMAGE. En Novative Technologies' liability on any claim of any kind shall be replacement of the En Core Sampler or refund of the purchase price. En Novative Technologies shall not be liable for penalties of any description whatsoever. In the event the En Core Sampler will be utilized by Customer on behalf of a third party, such third party shall not occupy the position of a third-party beneficiary of the obligation or warranty provided by En Novative Technologies, and no such third party shall have the right to enforce same. All claims must be brought within one (1) year of shipment, regardless of their nature.



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The En Core® Sampler is covered by One or More of the Following U.S. Patents: 5,343,771; 5,505,098; 5,517,868; 5,522,271. Other U.S. and Foreign Patents Pending

* Viton® is a registered trademark of DuPont Dow Elastomers.

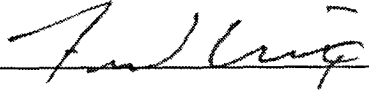
STANDARD OPERATING PROCEDURE


SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED FLUORESCENCE

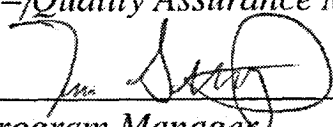
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RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED
FLUORESCENCE

1.0 PURPOSE

The primary objective of a SCAPS Laser Induced Fluorescence (LIF) push is to obtain high resolution vertical profile of contaminant and soil characteristics data in real time. The purpose of this Standard Operating Procedure (SOP) is to provide direction on proper data acquisition techniques through adherence to a site-specific Sampling and Analysis Plan (SAP) or Work Plan and implementation of quality assurance/quality control (QA/QC) measures.

2.0 BACKGROUND

SCAPS was developed as an alternative to collecting large numbers of soil samples using conventional drilling techniques and testing those samples at an off-site analytical laboratory. Conventional techniques provide assessment data following a delay of hours to days. Contaminated soil cuttings need to be disposed of and several deployments are typically required. SCAPS provides real time, high resolution assessment data using a direct-push probe based on Cone Penetrometer Test (CPT) technology that yields no soil cuttings. Time and expense of field deployments for contamination assessments are typically reduced using SCAPS.

3.0 APPLICABILITY

SCAPS LIF data acquisition techniques are applicable for assessing sites contaminated with petroleum, oils, and lubricants in soils of low to moderate density, and at locations and to depths accessible with a standard CPT rig. LIF and CPT soil classification data can be collected above and below the water table.

4.0 DEFINITIONS

SCAPS – Site Characterization and Analysis Penetrometer System. A system to obtain real time, subsurface assessment data on soil and chemical characteristics using a direct-push soil probe.

Clipping – Fluorescence intensity that exceeds the capability of the detector to quantitate, nominally greater than 250,000 counts.

CPT – Cone Penetrometer Testing relates cone pressure and sleeve resistance with soil types. Performed concurrently with LIF measurement while pushing the probe into the soil. CPT data can be used to objectively describe physical soil properties.

Data Acquisition Specialist – Person who operates the SCAPS laser and data acquisition system.

Field Log book – Contains records of Groundwater/Product Depths, Instrument Calibration Form, Sampling Identification and analyses (cross reference), Low Flow Well Purging-Field Data forms.

SCAPS Data Acquisition Logbook – A bound logbook dedicated to documenting the operation, maintenance, and quality assurance/quality control of the SCAPS system. The SCAPS Data Acquisition Logbook is system specific, and is separate from the project-specific field logbook

FSS – “Fischer Sea Sand” is a standard used as a system check for background fluorescence. A sample of washed sea sand, obtained from Fischer Scientific, is sieved and placed in a cuvette.

LIF – Laser Induced Fluorescence. The property of certain compounds to fluorescence in the presence of laser light. The character of the fluorescence can be related to petroleum and other compounds. Used as a primary tool in SCAPS assessment.

OMA – Optical multichannel analyzer spectrograph.

Pushroom Operator – The person who operates the direct-push hydraulic rams.

Push – The act of using the SCAPS rig to push an LIF probe into the soil. A push is the result of this action.

Qs10 – Quinine sulfate solution at 10 parts per million in a cuvette used as a fluorescence systems check before and after LIF pushes.

SAP – Sampling and Analysis Plan

Slit – A device that blocks incoming light, placed between the return fiber and the detector. Used to protect the detector from ambient light overload.

Window - Sapphire window mounted on a robe. Laser light and return fluorescence pass through the window.

WinOCPT – Software used to calibrate, control, and record LIF data.

5.0 REFERENCES

American Society for Testing Materials (ASTM). 1995, "Standard Test for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils". Designation D5778-95. Philadelphia, PA.

American Society for Testing and Materials, 1998, "Standard Test Method for Mechanical Cone Penetrometer Tests in Soil". Designation D3441-98. Philadelphia, PA.

6.0 APPARATUS AND MATERIALS

The Project Manager and SCAPS team shall plan for site assessment using LIF by reviewing the site-specific work plan. Prior to deploying, supplies shall be assembled, equipment shall be calibrated (if applicable), and tested. Procedures for equipment maintenance and calibration are addressed in separate standard operating procedures. Apparatus and materials that may be required include the following:

- SCAPS rig.
- SCAPS Data Acquisition Log book.
- Calibration and control standards.
- Paper towels.
- Methanol.
- Pen with indelible waterproof ink.
- Calibration standards.
- Approved plans and background documents – Approved SAP or Work Plan, Quality Assurance Project Plan (as appropriate).
- Site Health and Safety Plan and required equipment. The Site Health and Safety Plan, along with the site sign-in sheet should be on site and be presented by the site health and safety officer. Personnel-protective and air-monitoring equipment specified in the Site Health and Safety Plan should be demonstrated, present and in good working order on site at all times.
- Tool box equipped with maintenance supplies and equipment (e.g., replacement O-rings, rubber gaskets, expendable tips).

7.0 WARNINGS AND CAUTIONS

Laser light can cause eye and skin damage. The light is ultraviolet and invisible. Keep laser off unless the window is covered or below ground surface.

Keep the slit in to protect the detector from ambient light unless the window is covered or below ground surface or wear laser protective eyewear if working near exposed

laser beam. ***Ambient light can damage the detector, which is difficult or impossible to replace.***

When the slit that blocks ambient light to the detector is removed, the slit receptacle slot is covered using an abbreviated slit (short slit), shortened to allow light traveling in the fiber optic to reach the detector while blocking the light that could travel down the unoccupied slit receptacle potentially damaging the detector.

Use caution when the truck is in motion. When the ladder is up, the truck may move. Brace yourself and secure loose items when the truck is in motion. Do not leave or enter the truck if the ladder is up.

8.0 PROCEDURE

This procedure addresses the specific activities to be performed to acquire data during LIF pushes using SCAPS.

8.1 Review of SAP or Work Plan

To prepare for LIF pushes, the Project Manager shall meet with the designated Data Acquisition Specialist to review the site SAP or Work Plan and convey the following information:

- Identification number(s) of the pushes.
- Push locations.
- Data requirements, including total depths.
- Anticipated soil condition and depths, and depth(s) of contamination.
- Thickness of pavement cores, if applicable.
- Other SCAPS testing, in addition to LIF, that may be performed.

The Project manager shall record information obtained during LIF pushing in the Field Logbook that is dedicated to the project, as described in the SAP or Work Plan.

The SCAPS Data Acquisition Specialist shall record all SCAPS QA/QC systems checks and systems operation and maintenance notes in the separate SCAPS Data Acquisition Logbook.

8.2 Equipment Inspection

Prior to using LIF equipment:

- Make sure all necessary equipment and supplies are on board.
- Inspect equipment for dirt and damage.

8.3 Daily Equipment Initialization – Power Up Sequence

When the SCAPS rig has arrived at the site, the equipment may be powered up:

1. Lift the bench top to access the laser. Take care to avoid bumping fiber optics!
2. Check and record the xenon chloride gas pressure. The gauge is on the laser unit.
3. Turn the laser on, turning the the laser key $\frac{1}{4}$ turn to the right.
4. Verify the larger of the two slits is "in" place on the detector. It is **Extremely Important** to keep this slit in when the probe is exposed to ambient light (i.e., at all times the probe is out of the ground except when calibrating.)
5. Turn on the optical multichannel analyzer (OMA) unit.
6. Turn on the computer.
7. Initiate the pre-push calibration sequence as follows.
8. Open WinOCPT software.
9. Select the drop-down File menu, click New, enter a push name
10. Select Edit > Probe geometry, ensure that all values are correct for the probe in use. Measure probe with tape measure if necessary.
11. Place probe on metal supports, on the side of the bench.
12. Inspect the window or fogging, dirt, and damage.
13. Gently clean window with a drop of methanol on a laboratory tissue.
14. Carefully place the cuvettes of quinine sulfate (Qs10) calibration standard and Fischer Sea Sand (FSS) control standard on the probe with the Qs10 on the sapphire window and the FSS immediately next to it.
15. Remove the larger slit and replace with the short slit.
16. Make sure laser operation is external so that the computer controls laser firing by selecting the "EXT" switch position on the laser unit.
17. Select the Run dropdown menu, follow the single point measurement sequence, record the Maximum, Average, standard deviation, and wavelength in the SCAPS Data Acquisition Logbook laser statistics for QS10 and FSS.
18. Adjust laser power during the QS10 systems check, if necessary, to avoid clipping (>250,000 counts) and low response (<150,000 counts).
19. Repeat the QS10 systems check sequence a minimum of three times.
20. Turn laser off. Replace the larger light-blocking slit. Remove cuvettes.

8.4 SCAPS Push Sequence

When probe is clamped and ready:

1. In WinOCTP software, open a new push file. "File > New" (Insert a "0" to the automatic numbering if less than 10).
2. Click "Yes" (usually) to "preload documentation from WinOCPT?" For the first push of a project, insure accuracy of the data such as project name and personnel.
3. Minimize project information window.
4. "File > Load Views" and select "3+.view" or another project specific view.
5. Initiate a scripted push, For the first of day, perform single-point pre-push measurements described above in "Daily Equipment Initialization".
6. Initiate the script sequence
7. Click Run then Script then press <enter> <enter> to accept defaults. (There is only one script, "SCAPS LIF collection sequence #1")
8. Record push filename in log book.
9. Window showing cone and sleeve readings appear. Record cone and sleeve readings in log book. Cone readings should be ± 5 , sleeve ± 0.5 .
10. Close cone/sleeve window
11. "Check sapphire window"
12. Put Qs cuvette on window.
13. Take slit out and replace with the short slit.
14. Turn the switch on the laser unit to "RUN"
15. Confirm trigger mode switch on the laser body is on external (EXT).
16. Press <enter> <enter> to accept defaults when asked to "Identify This Measurement"
17. Review the data graph. "Show Statistics" If acceptable "Script > Accept" and record data in log book.
18. Slide the cuvettes so the FSS cuvette covers the window. Allow no ambient light into the window.
19. Press <enter> <enter> to accept defaults.
20. Review the data graph. "Show Statistics" If acceptable "Script > Accept" and record data in log book.
21. Put the longer ambient light blocking slit in. Turn laser off. Remove cuvettes.
22. Verify tip is on probe.
23. Tell pushroom operator: "You may now lower probe to ground level." Operator will lower the probe to ground surface then say "Depth Zero".

24. Close graphs to clear the screen.
25. <Enter> when the probe is at ground level.
26. Record time in log book.
27. <Enter> <enter> to accept defaults.
28. Tell pushroom operator: "Begin the push".
29. Turn laser on.
30. At 2.2 feet (or more if surface cored), remove slit. For a 6" core, allow laser to fire twice before lifting slit and replacing it with the shortened slit.
31. Observe data acquisition. Make depth is recorded consistently. Look for possible sensor failures in cone and sleeve. Note high LIF readings and wavelength changes. Tell project manager immediately of any noted observations.
32. At bottom of hole, "Run > Terminate"
33. Put the larger light blocking slit in.
34. Laser off
35. Suspend Script (defer system checks)
36. Record time in SCAPS Data Acquisition Log book.
37. Tell the pushroom operator to raise the probe to surface.
38. Wipe probe window first with paper towel, then with tissue moistened with methanol.
39. Inspect window for fogging, pitting, damage, etc.
40. Place Qs cuvette on probe window. Place FSS cuvette next to Qs cuvette.
41. remove the larger slit and replace it with the small slit
42. <enter> <enter> to accept defaults.
43. Review the data graph. "Show Statistics" If acceptable, "Script > Accept" and record data in SCAPS Data Acquisition Logbook.
44. Slide the cuvettes so the FSS cuvette covers the window. Allow no ambient light into the window.
45. Press <enter> <enter> to accept defaults.
46. Review the data graph. "Show Statistics" If acceptable, "Script > Accept" and record data in log book.
47. Put the larger light-blocking slit in.
48. If last push of the day, confirm the larger light blocking slit is in. Turn laser off. Remove cuvettes. Otherwise, repeat push sequence.

49. Copy push files to auxiliary computer.

8.5 Shut down – Power off

At the end of the day, the following steps shall be followed:

1. Copy remaining push files to auxiliary computer.
2. Copy the files on data acquisition computer to subdirectory.
3. Turn off equipment in reverse order:
4. Turn off computers.
5. Switch OMA off.
6. Switch off laser with key.
7. Secure computer monitor, log books, methanol bottles, and other loose objects.

9.0 DOCUMENTATION

Document all procedures and equipment used in data acquisition in the log book.
Record all applicable data including:

- Equipment calibration.
- Equipment configuration.

10.0 ATTACHMENTS

Attachment 1: Example log book entry.

RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

SCAPS DATA ACQUISITION PROCEDURES FOR LASER-INDUCED
FLUORESCENCE

ATTACHMENT A

SCAPS LIF LOG BOOK ENTRY

1/25/07

Energy 8.7
 Push Filename: FA02-38-LF PSH Cone: 0.312 Sleeve: -0.005
 J10 Pre Push: 467 nm 202221 max 192872 X 2.55 sd
 J10 Pre Push: 478.7 nm 4761 max Start 9.25
 End: 9.32 @ 17.95 Cone: 0.243 Sleeve: -0.005
 J10 P st push: 468 nm 218240 max 194826 X 5.87 sd
 JSS P Push: 471.2 nm 4686 max Spectra Depth _____

Nitrogen Press: _____ Energy _____
 Push Filename: FA02-39-LF PSH Cone: 0.249 Sleeve: -0.001
 J10 Pre Push: 468 nm 200303 max 187488 X 5.3 sd
 J10 Pre Push: 477 nm 481.8 max Start _____
 End: 9.50 @ 17 Cone: 0.251 Sleeve: -0.003
 J10 P st push: 467 nm 194324 max 178710 X 4.1 sd
 JSS P Push: 472 nm 4438 max Spectra Depth _____

Nitrogen Press: _____ Energy 8.8
 Push Filename: FA02-40-LF PSH Cone: 0.253 Sleeve: -0.005
 J10 Pre Push: 468 nm 206192 max 192998 X 5.76 sd
 J10 Pre Push: 474 nm 4559 max Start _____
 End: 12.20 @ 17.75 Cone: 0.249 Sleeve: -0.002
 J10 P st push: 4678 nm 178800 max 170536.3 X 2.49 sd
 JSS P Push: 472.1 nm 4254 max Spectra Depth _____

Systems checked -

ran about 2 dozen systems
 check quickly. First checks

had 95 10 cs low as 170k's,
 with distinct 3 cones (per SD) -
 but the last half dozen or so
 were above 200k w/ good SD.
 Immediately started pre-push
 script for FA02-41-LF - T.S.

Energy _____
 Push Filename: FA02-41-LF PSH Cone: 0.280 Sleeve: -0.002
 J10 Pre Push: 467.8 nm 207976 max 192904 X 3.993 sd
 J10 Pre Push: 471.0 nm 0232 max Start 10.38
 End: 10.57 @ 17 Cone: 0.274 Sleeve: -0.006
 J10 P st push: 467.7 nm 182675 max 165920 X 8.36 sd
 JSS P Push: 474.9 nm 3839 max Spectra Depth _____
 Continued on Page _____

Read and Understood By _____

Signed _____

Date _____

Signed _____

Date _____


STANDARD OPERATING PROCEDURE

ENVIRONMENTAL SOIL SAMPLING

SOP NUMBER: T-006

REVISION NUMBER: 0

REVISION DATE: MAY 2, 2007

Prepared by: 
Jason Williams

5/29/2007
Date

Reviewed by: 
Jesse MacNeill - Quality Assurance Manager

5/29/07
Date

Approved By: 
Tim Shields - Program Manager

5/30/07
Date

Richard Brady & Associates

Engineering and Construction

3710 Ruffin Road
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RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

ENVIRONMENTAL SOIL SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) provides direction and establishes guidelines and procedures for field personnel collecting soil samples for environmental laboratory chemical analysis. This SOP is not intended to apply to every situation that may be encountered, nor is intended to replace thorough training and reading of reference materials.

2.0 BACKGROUND

Responsible parties and regulatory agencies make decisions about protecting human health and the environment from chemicals that may have been released during historic or current site activities. Chemical analysis of soil samples is often one source of information used in making environmental decisions. Soil sampling may be used in conjunction with various methods of subsurface investigations using various techniques.

3.0 APPLICABILITY

Soil sampling activities are applicable but not limited to activities associated with site construction, site demolition, underground storage tank removal, pipeline removal, site investigations, and remedial activities. This SOP is applicable to all soil sampling activities.

4.0 DEFINITIONS

Analyte - A chemical component of a sample to be determined or measured.

Analytical (or Testing) Method - A specification for sample preparation and instrumentation procedures or steps that must be performed to estimate the quantity of analyte in a sample.

Auger - A device for sampling subsurface soil.

Chain-of-custody - A protocol to insure the integrity of samples and resulting analytical results. Written forms indicating the date and time of transfer (e.g., from a sampler to the lab) are used. The procedure accounts for the whereabouts and handling of a sample and data from collection to final determination.

Drive sampler - A sample device that utilizes a hand held slide hammer to drive a six inch barrel to shallow subsurface depths. Typically used when collecting samples with a hand auger.

Encore sampler – One of several specific types of sampling devices for collecting samples for analysis for Volatile Organic compounds (VOCs) in accordance with EPA test method 5035/8260.

Field Log book – A project-specific record of information in a bound field notebook gathered by field personnel.

Hand auger – A small manual auger used for shallow subsurface sample borings

Hollow-stem auger – A small-diameter (typically 6- to 12-inch) drilling technique commonly used for collecting soil samples and installing monitoring wells.

Matrix - The sample medium in which analytes of interest are tested. The media in which analytes are tested includes water, soil and solids.

Piston-type sampler - Sampling device used to collect soil samples at a discrete depth when a piston is released to allow soil to enter the sampler. The sampler is typically lined with 21" (three-6", and one-3") of brass or stainless steel tubing. It does not split or break apart, the soil sample, inside the tubing, is carefully extruded from the sampler. Piston-type samplers are typically used with direct-push technology.

SAP – Sampling and Analysis Plan

SCAPS – Site Characterization and Analysis Penetrometer System. A system to obtain real time, subsurface assessment data on soil and chemical characteristics using a direct-push soil probe. Soil samples can also be collected using a direct-push piston-type sampler.

Split-barrel/spoon sampler – One of several specific types of sampling devices for retrieving representative soil samples from discrete depths. Use of these samplers requires the lining the interior of the sampler with appropriate sampling tubes, usually brass or stainless steel.

VOC - (Volatile Organic Compound). Chemicals that have a low boiling point and evaporate easily containing hydrogen (H), carbon (C), and possibly other elements.

Underground utilities - Include, but are not limited to, utilities (sewer, telephone, fuel, electric, water, and other product lines), tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during excavation operations.

5.0 REFERENCES

Navy Installation Restoration Laboratory Quality Assurance Guide, Naval Facilities Engineering Service Center (NFESC), Interim Guidance Document (Feb 1996).

Navy/Marine Corps Installation Restoration Manual, Naval Facilities Engineering Services Command (NFESC) (February 1997).

San Diego County, Department of Environmental Health (DEH), Site Assessment and Mitigation Program (DEH-SAM), Site Assessment Manual (2004).

California Department of Toxic Substances Control, Hazardous Materials Laboratory, User's Manual, Revision 12, January 2001.

CCR Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.20(c).

EPA, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Revision 5, April 1998.

County of San Diego, Department of Environmental Health, Land & Water Quality Division, Site Assessment and Mitigation Program (SD DEH). Site Assessment and Mitigation Manual. http://www.sdcounty.ca.gov/deh/lwq/sam/manual_guidelines.html (This manual is updated yearly.)

6.0 APPARATUS AND MATERIALS

Select and assemble the types of equipment, instruments, and supplies necessary to perform the scope of work in accordance with the project specifications. A suggested checklist of apparatus and materials is included as Attachment A.

7.0 SOIL SAMPLING PROCEDURES

This procedure addresses the specific activities to be performed to accomplish a soil sampling event, including review of the Sampling and Analysis Plan (SAP), preparation for a sampling event by identifying necessary equipment and supplies, general sample collection procedures, including more details drilling activities and field documentation requirements.

7.1 Responsibilities

Project Manager (PM): The PM is responsible for ensuring that Richard Brady & Associates field personnel have been trained in the use of this procedure and for verification that soil sampling activities are performed in compliance with the Work Plan and this SOP.

Physical Science Technician (PST): The PST is responsible for compliance with this SOP including collection of samples, containerization of samples, and documentation.

7.2 Review of Sampling and Analysis Plan

In preparation for a soil sampling event at a given site, Richard Brady & Associates staff will review the site Sampling and Analysis Plan (SAP) and identify the following information:

- Identification number(s) of samples to be collected,
- Locations of the sample points,
- Location access requirements (e.g., permission of owner, locked gates, road conditions),
- Field and analytical parameters to be tested,
- Type and number of sample containers needed,
- Sample preservation methods,
- Volume of samples required for analysis,
- Type and number of QA/QC samples to be collected (e.g., duplicates, splits, and blanks), and
- Type of equipment needed for the scheduled sampling activity.

A location map shall be provided for use in the field. Copies of sampling specifications shall also be provided for field reference (if necessary).

Field information and data obtained during the sampling event shall be recorded in a logbook that is dedicated to the project.

7.3 Equipment and Supplies

Richard Brady & Associates staff shall plan for the sampling event by assessing, selecting, and assembling the types of equipment, instruments, and supplies necessary to perform the scope of work. Prior to going to the field, instrumentation shall be assembled, calibrated (if applicable), and tested. See Attachment 1.

7.4 General Soil Sampling Procedures

Determine sampling locations and depths. Determining these locations depends on the nature of the sampling. In most cases, sample locations and

depths will be determined prior to field mobilization and outlined in the site-specific SAP.

After sample locations have been determined, penetrate the existing surface with sampling device; the depth will depend on the circumstances.

When sample depth is attained, push/hammer sample (depending on sample method), until reaching undisturbed soil.

If the soil is potentially impacted with hydrocarbons, it is usually desirable to obtain field organic vapor readings. After removing and breaking apart the sampler, collect a representative soil sample and place in a suitable container, such as a Ziplock bag, and record the result from the organic vapor analyzer (OVA).

Collect representative soil samples in accordance with the SAP, ensuring correct sample container, preservation, labeling, storage, packing, and conveyance.

Record the sampling information on the site plan, soil sample log, and a chain of custody form. Collect sample location information in accordance with the SAP, which may call for GPS or other location reference.

Place the soil samples in a cooler packed with ice packets for cold storage pending transport to the environmental laboratory.

The Project Manager is responsible for monitoring and documenting observations made during excavation activities in a field log. At a minimum the following information should be recorded prior to excavation activities: date, arrival time, site location, weather, onsite staff, any contractors (names and phone numbers), and the type and quantity of equipment. During sampling activities the following information should be logged: start and stop time and location of all activities, blow counts performed to advance the sampler through each 6-inch interval, description of the lithology encountered in accordance with the Unified Soil Classification System, odors and/or staining observed, depths and times which samples were taken, OVA readings (if taken), depth to water (if applicable), and problems causing delays during any activities.

All sampling equipment should be decontaminated in accordance with the Richard Brady & Associates SOP T-001 Equipment Decontamination between all samples collected.

7.5 Subsurface Sampling Using a Split-barrel/spoon Sampler

Split-barrel/spoon samplers can be various lengths and are typically used for deeper samples with the hollow-stem auger. The following procedures provide directions for each step for this method of sampling.

Decontaminate the split-barrel sampler and all other equipment.

Begin augering to specified sample depths following SOP T-004 Hollow Stem Auger Drilling.

After augering to a depth above the specified sample interval, stop augering and hammer the split-barrel sampler to the desired sample depth.

Remove the sampler, break the sampler apart by unscrewing the ends and retrieve the tubing containing the sample.

Collect the samples from the tubing depending on the preferred analysis. If the analysis is for VOCs, the SOP T-003 for Soil Sampling Procedure for Volatile Organics using the En Core® Sampler should be followed.

- The stainless steel or brass tubing can be used for some other analysis or kept as a back-up sample. If this is the case, the tube ends should be wrapped in Teflon sheets and capped. Sealing the caps with silicon tape is optional. Do not use adhesive tape to seal the caps.

The sampler and all equipment used to collect the sample should then be decontaminated following the SOP T-001 Equipment Decontamination.

Repeat these steps until the specified number of samples have been collected from each boring.

7.6 Subsurface Sampling Using a Hand Auger (with drive sampler)

Hand augering may be used to collect soil samples from shallow depths when larger drilling equipment is not warranted. The collection of soil samples using a hand auger is typically used in conjunction with a drive sampler. The following procedures provide the minimum direction for each step of a soil sampling activity using hand auger equipment in conjunction with a drive sampler.

Decontaminate the hand auger, drive sampler barrel and other equipment. Hold the auger vertical, apply pressure, and rotate in a clockwise direction through the soil.

When the auger bucket is full of soil, remove it from the boring and transfer the contents to the plastic sheeting located around or next to the bore hole.

Repeat previous two steps until achieving a depth above the desired sample depth.

Using the drive sampler, hammer the sample barrel (loaded with specified tubing) until it has been driven to the desired depth.

Remove the sample by gently tapping the hammer in an upwards motion as to not remove the soil sample from the sample barrel.

Once the sample has been removed from the boring removed the tubing from the barrel by unscrewing the end and carefully extruding the sample.

The hand auger, drive sampler, and all other equipment used to take the sample should then be decontaminated following the SOP T-100 Equipment Decontamination.

Repeat these steps until the specified number of samples have been collected from the boring or until a depth is reached at which other means of collecting samples are necessary.

7.7 Subsurface Sampling Using SCAPS

Collecting soil samples using SCAPS utilizes a hydraulic press to push a piston-type sampler to the desired sample depth. This method is extremely precise in collecting samples from specific depths. The following procedure provides each step of a soil sampling activity using the SCAPS direct-push piston-type sampler.

Decontaminate the piston-type sampler (must be taken apart) and all other equipment that comes in direct contact with the sample.

The SCAPS unit is aligned above the specific sample location.

The piston-type sampler is pushed to a depth above the desired sample depth.

The piston is released using a wire cable, and the sampler is pushed to the desired sample depth. The typical sample interval is 18" (1.5').

Once the sample has been taken, the piston-type sampler is removed by retracting the hydraulic press.

The sample is removed by carefully extruding the tubing from the sampler.

The piston-type sampler and all other equipment used to take the sample should then be decontaminated following the SOP T-100 Equipment Decontamination.

Repeat these steps until the specified number of samples have been collected from the push.

7.8 Subsurface Sampling during Trench Excavation Activities

Soil samples are collected from trench excavation sidewalls and bottom at a spatial intervals and depth specified in the project work plan or field sampling plan to accomplish specific project goals. The samples are collected by hand directly from excavation equipment. This is done specifically to eliminate hazards associated with having personnel enter potentially unstable excavations.

Soil samples are immediately collected as soon as the excavation equipment is withdrawn from the hole. Soil is initially collected by placing approximately four cubic inches of soil from the excavator bucket into a decontaminated stainless steel bowl. The sample is then obtained by packing a laboratory-supplied sample container with soil, being careful to leave no headspace in the container. The soil in the bowl will not be mixed and as many soil horizons as possible will be sampled to obtain as representative a sample as possible. All soil sample containers are immediately sealed capped with the supplied lid, and are labeled with the project and sample number, collection depth, date, and time. This information is then entered on the chain of custody document. The sample is

stored at the proper preservation temperature in an ice chest packed with double-bagged wet ice (4° C environment) until analysis. In the case of Encore samples, the sample is collected using the Encore sampling SOP T-003.

Residual sample soil not placed in containers for laboratory analysis may be screened for combustible vapors using a combustible gas indicator (CGI) or equivalent instrument. For each vapor-screening event, soil is added to a 6-inch long by 2.5-inch diameter sample insert until it is approximately 1/3 full. The insert is capped, shaken, and penetrated with a probe inserted through a small opening in the cap. For hydrocarbon impacted soils, use an organic vapor analyzer (OVA) and place the probe inside the borehole and record the flame ionization detector (FID) reading taken after approximately 20 seconds and record the value in the boring logs.

7.9 Stockpile Soil Sampling

Generate a 2-dimensional grid to represent the stockpile, and select sample locations at random. Third dimension grid points (depths) are also randomly selected at each 2-dimensional grid location. Undisturbed samples are to be collected using a hand-auger / hammer driven system. A schematic of the contoured and gridded stockpiles with sample locations is shown in a figure in the final report.

7.10 Demobilization/Site Restoration

After the excavation has been backfilled:

- Repair surfaces to approximate pre-drilling conditions;
- Repair all surface structures as per the contract;
- Identify and isolate with barricades remaining hazards, if any;
- Containerize, label, and manage investigative derived waste,

8.0 DOCUMENTATION

Document all procedures, observations, and equipment used during excavation and sampling activities on the field log and forms related to the project.

RICHARD BRADY AND ASSOCIATES
STANDARD OPERATING PROCEDURE

ATTACHMENT 1

EQUIPMENT AND SUPPLY CHECKLIST

EQUIPMENT AND SUPPLY CHECKLIST

Work Plan or Sampling and Analysis Plan
Health and Safety Plan
Underground Service Alert (USA) number
Personal safety gear:
 traffic vest,
 steel toe shoes,
 work gloves
 earplugs,
 sunscreen,
 hardhat,
 drinking water
Gloves (e.g., powder-free nitrile)
Warning signs, barricades, cones, and yellow caution tape
Field log (notebook and forms)
Log forms
Pens
Hand auger
Shovel and other various hand tools
Buckets
Brushes
Liquinox
Deionized water
Deionized water sprayer
Gas and vapor monitoring equipment
Utility mark out report
Underground Locating Service (ULS)
Drilling permit issued by local government agency
Digging Permit issued by facility (e.g., Public Works Center)
Safety fence and flashing lights for night-time vehicle or pedestrian traffic
Soil logging equipment
Chain of Custody forms
Sample forms
Sampling trowel, scoop, spoon, etc. (not too big, expect 4 oz jars)
Soil sampling equipment
Teflon sheets for sample sleeves
Sample jars
Tool box
Hammer
Vise

Baggies, large and small
Sample labels
Sharpie pens
Plastic sheets for sample prep
Plastic sheeting (6 mil. Min.)
Soil classification chart
Color chart
Hand lens
Ice Coolers for samples
Ice
Visqueen
Drum labels
Clipboards
Paint for marking out auger locations
Water level indicator
Survey equipment (e.g., GPS unit)
Camera
Trash bags
Dustpan foxtail
Two tables: one for sampling, one for drying samplers
Large paper clamps/clips for windy days
Ice Coolers for drinks (must be marked FOOD ONLY)
Shade
Chairs
EnCore® sampling devise extractor (if applicable),
Instrument for measuring organic vapor concentrations such as a
photoionization detector (PID) and/or a flame ionization detector (FID),

NOTE: The SCAPS truck and support trucks should be equipped with all SCAPS specific equipment for collecting soil samples.

APPENDIX B

FIELD DATA COLLECTION FORMS

FIELD CHECKOFF LIST

Client: _____

Project #: _____

Field Personnel: _____

Date: _____

Location: _____

Equipment Category	Verification			Equipment Category	Verification		
	Yes	No	NA		Yes	No	NA
General				General Sampling Supplies			
Camera				Sample Containers			
Mobile Phone				Ice			
First Aid Kit				Coolers			
Tool Box				Gloves (nitrile) (powder free)			
Site Keys (wells, gates)				Shipping Labels			
Marking Paint/Stakes				Custody Seals			
Paperwork				Packing Tape			
Project Notebook				Ziplock Bags			
Contact Sheet				Ultra Pure Water			
Permits				55 Gallon Drum(s)			
Right of Entry(s)				Markers/Ink Pens			
Workplan				Plastic Sheeting			
Site Safety Plan				Soil Sampling Supplies			
Chain of Custody(s)				Sleeves (Brass or Stainless)			
Sample Labels				Sleeve Caps			
Interment Calibration Log				Teflon Sheeting			
Utilities Clearance				Aluminum Foil			
40 Hr./8 Hr. Field Cards				Encore Samplers (w/ T-bar and SOP)			
Instruments				Hand Auger (w/ extensions)			
pH/Temp/Cond Meter (w/ cal. fluid)				Drive Sampler (w/ Tubes)			
TDS meter				Shovel / Spade			
EC				Pocket Knife			
DO				Trowel			
PID (w/ calibration gas)				Water Sampling Supplies			
FID (w/ calibration gas)				Disposable Bailers			
LEL (w/calibration gas)				Filters for Dissolved Analyses			
TVA (w/calibration gas)				Bailer (PVC or Stainless)			
Decontamination Equipment				Twine/String			
Buckets (3)				Rope			
DI Water				Low Flow Pump (QED)			
Liquinox (or equivalent)				Peristaltic Pump (w/ Tubing)			
Scrub Brushes				Submersible Pump (w/ Tubing)			
Paper Towels				Water Level Probe			
Health and Safety Equipment				Interface Probe			
Draeger Pump w/ Tubes				Air Sampling Supplies			
Respirator (half or full face)				Tedlar Bags			
Respirator Cartridges				Summa Canister			
Respirator Wipes				Air Sampling Pump (w/ Tubing)			
Work Gloves							
Tyvek Suits							

(

SCAPS Soil Sample Description Form

<u>SAMPLE ID:</u>	SAMPLED BY:	DATE:	TIME:	SAMPLE LOCATION RELATIVE TO CPT LOCATION
SAMPLE PUSH INTERVAL (AS PUSHED):				
SAMPLE INTERVAL (CONVENTIONAL DRILLING):				
RECOVERY (TUBES OR FOOTAGE):				
0 ½ 1 1½ 2 2½ 3 3+				
TUBE COLLECTED FOR SAMPLE: <i>TOP MIDDLE BOTTOM</i>				
END OF TUBE MARKED FOR ANALYSIS: <i>TOP BOTTOM NA</i>				
NOTES REGARDING SAMPLE DEPTH:				
<u>SOIL DESCRIPTION:</u> COLOR (MUNSELL)				
GRAIN SIZE / SOIL DESCRIPTION:				
USCS CLASSIFICATION:				
DENSITY DESCRIPTION:				
MOISTURE DESCRIPTION:				
STAIN AND ODOR DESCRIPTION:				
NOTES REGARDING SOIL DESCRIPTION:				

<u>SAMPLE ID:</u>	SAMPLED BY:	DATE:	TIME:	SAMPLE LOCATION RELATIVE TO CPT LOCATION
SAMPLE PUSH INTERVAL (AS PUSHED):				
SAMPLE INTERVAL (CONVENTIONAL DRILLING):				
RECOVERY (TUBES OR FOOTAGE):				
0 ½ 1 1½ 2 2½ 3 3+				
TUBE COLLECTED FOR SAMPLE: <i>TOP MIDDLE BOTTOM</i>				
END OF TUBE MARKED FOR ANALYSIS: <i>TOP BOTTOM NA</i>				
NOTES REGARDING SAMPLE DEPTH:				
<u>SOIL DESCRIPTION:</u> COLOR (MUNSELL)				
GRAIN SIZE / SOIL DESCRIPTION:				
USCS CLASSIFICATION:				
DENSITY DESCRIPTION:				
MOISTURE DESCRIPTION:				
STAIN AND ODOR DESCRIPTION:				
NOTES REGARDING SOIL DESCRIPTION:				

COCC- of

1 = Nitric Acid(HNO3) 2 = Hydrochloric Acid(HCl) 3=Sulfuric Acid(H2SO4) 4 = Sodium Hydroxide(NaOH) 5 = Zinc Acetate(ZnC2H3O2)
6 = Sodium Thiosulfate(Na2S2O3) 7 = Ascorbic Acid(C6H8O6) 8 = Sodium Bisulfate(NaHSO4) 9= Monochloroacetic acid(C2H3O2Cl) NA = Not applicable 10 = Other

FIELD CHANGE FORM

Site Name/Project Title: _____

Project Manager: _____

Date: _____

Client: _____

SAP Approved by: _____

SAP Date: _____

Field Change:

Reason for Field Change:

Overall Project Impact: ☐ Insignificant

☐ Significant (list below corrective action)

Corrective Action:

Requested by: _____

Date: _____

Approved by (PM) : _____

Date: _____

Approved by (QC Manager): _____

Date: _____

ATTACHMENT B

DEPARTMENT OF THE NAVY – NAVFAC SOUTHWEST
Naval Facilities Engineering Command
1220 Pacific Highway San Diego, California 92132-5190



FINAL HEALTH AND SAFETY PLAN

**SCAPS LASER INDUCED FLUORESCENCE
TARRY REFINERY WASTE INVESTIGATION
FORMER OIL REFINERY
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

***Contract Number: N68711-03-D-4302
Task Order: 237018
DCN: RBAE.4302.7018.0009***

October 12, 2007

Prepared by:

Richard Brady & Associates
Engineering and Construction


3710 Ruffin Road
San Diego, California 92123

**FINAL
HEALTH AND SAFETY PLAN**

**SCAPS LASER INDUCED FLUORESCENCE
DATA GAP INVESTIGATION
INSTALLATION RESTORATION SITE 13
ALAMEDA POINT
ALAMEDA, CALIFORNIA**

**Prepared for:
Department of the Navy - NAVFAC Southwest**

Prepared by:




Craig Haverstick
Health and Safety Manager

12 OCT 07

Date

Reviewed by:



Timothy Shields
Program Manager

12 OCT 07

Date

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1.0 INTRODUCTION

This site-specific Health and Safety Plan (HASP) has been prepared in conformance with 29 CFR 1910.120. It addresses on-site health and safety procedures that are intended to guide field activities at the project work site. This HASP establishes procedures to protect workers and the public from potential hazards posed by work at this site. Chemical and physical hazards that may be encountered at the job site are identified in this plan, which sets forth the various duties of key personnel involved on the job site investigations and related field work.

Elements of this plan include procedures for personal protection, personnel and equipment safety, medical surveillance, air quality monitoring, and general on-site work practices. Additionally, this plan contains provisions for emergency procedures, including emergency response and first-aid capabilities. All personnel including Government employees, subcontractors, and third parties who enter the site work zones are required to comply with this plan. Site access for any person includes reading and signing the Log/Compliance Agreement Form.

The following criteria provide the basic standards for all site activities and this site health and safety plan. The criteria include instructions, regulations and guidelines, as excerpted from:

United States Department of Labor Occupational Safety and Health Administration (OSHA), Title 29 Code of Federal Regulations, Parts 1910 (General OSHA Standards) and 1926 (Safety and Health Standards for Construction)

USEPA Standard Operating Safety Guides, June 1992.

NIOSH/OSH/OSHA/USCG/USEPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

United States Department of Army, U.S. Army Corps of Engineers Safety and Health Manual, EM 385-1-1, November 2003.

This plan is based on the best available information and has been written for the exclusive use by Richard Brady & Associates (RBA) employees and subcontractors working on the site. In addition, all subcontractors are required to submit a properly completed activity hazard analysis (AHA) for the tasks that they are expected to perform. The subcontractors AHA will be reviewed and approved by the RBA EHSC prior to fieldwork. This HASP may be amended should site conditions, procedures, or personnel change. RBA claims no responsibility for use of this plan by others.

2.0 SITE/WORK DESCRIPTION

The objective of this SCAPS LIF investigation is to conduct a site characterization at Installation Restoration (IR) Site 13 Alameda Point, Alameda, California including: characterizing the horizontal and vertical extent of petroleum contamination, sample limited locations to verify concentration and type of contaminants in soil and groundwater, and determine useful

monitoring well locations. The work to be conducted for this project is more completely described in the Sampling and Analysis Plan (SAP).

2.1 IR Site 13

IR Site 13 is located on the south eastern portion of the base, at the intersection of West Pacific Avenue and Skyhawk Street. The area that is now IR Site 13 encompasses the majority of the former location of the Pacific Coast Oil Works Company Refinery, which operated from 1879 to 1903. The bulk of refinery operations occurred in the southern portion of IR Site 13. Petroleum refinery operations in the late 1800s consisted of distilling crude oil to kerosene and fuel oil. Wastes from this type of operation would be expected to include heavier-end hydrocarbons that weather to an asphaltic-like consistency.

3.0 KEY PERSONNEL

3.1 Program Manager

The Program Manager is responsible for technical coordination and oversight of the RBA technical team. The Program Manager will approve this HASP and ensure that elements of this HASP are implemented.

3.2 Project Manager

The Project Manager (PM) will serve as the primary point of contact. PM responsibilities include monitoring field logbook for health and safety practices, ensuring emergency response procedures are implemented, and verifying corrective actions are implemented. In addition, the PM is will ensure that personnel receive this plan, are familiar with the contents, and aware of potential hazards associated with site or project operations.

3.3 Environmental, Health & Safety Coordinator

The EHSC will be responsible for preparation of the HASP, and will advise or direct the site safety activities of the Project Site Safety Officer (SSO). The EHSC has the authority to stop unsafe operations, remove unqualified personnel from the work area, and approve changes to the HASP. The EHSC may be requested to act as the SSO for the PM.

The EHSC is responsible for integrating all aspects of the HASP development and implementation. EHSC duties include reviewing the SSO implementation of the HASP, advising the SSO on all related Health and Safety aspects, reviewing any site Specific Plans for compliance and completeness, as well as establishing and monitoring all related Health and Safety procedures through site safety audits.

3.4 Project Site Safety Officer

The Project SSO will conduct the daily safety meetings and will interface as required with other site representatives.

The SSO duties include:

- 1) assuring that appropriate safety equipment is available and utilized as necessary to fulfill plan provisions;
- 2) performing safety monitoring;

- 3) establishing the exclusion, decontamination and support zones;
- 4) documenting accidents, incidents, or plan non-compliance issues, and
- 5) initiating emergency response procedures when necessary.
- 6) establishing emergency communications with all potential emergency response organizations and verifying all emergency telephone numbers prior to initiating fieldwork.

Prior to commencement of work, the SSO will review plan requirements with all personnel on-site. The review will include a site-specific briefing with workers on:

- 1) potential physical and chemical hazards that could be encountered,
- 2) expected safe work practices to prevent accidents or hazards to workers and others in the project area,
- 3) directions to nearest medical facility,
- 4) site evacuation procedure applicable to the project and
- 5) a general overview of the plan. It is the responsibility of the workers to read this plan before signing the Site Log/Compliance Agreement Form.

The SSO performs duties such as confirming personnel are fit for duty, coordinating emergency medical care, posting daily air monitoring results, conducting a daily site safety inspection, and inspecting health and safety equipment. The SSO is certified in First Aid and CPR, and has also received training in bloodborne pathogens.

A written log will be kept for all activities; this information can be included into the site logbook or entered into a separate safety log. The SSO will investigate all accidents and prepare an accident investigation report that will be forwarded to appropriate regulatory agencies depending on the nature and severity of the accident or injury. Project Safety Inspections will be conducted daily by the SSO and/or the Project Manager.

The SSO is responsible for on-site implementation and enforcement of the site safety program and procedures. SSO will oversee any personnel monitoring and will decide when action levels have been reached which require more stringent personnel protection.

3.5 Employee Safety Responsibility

Although the employer is responsible for providing a safe and healthful workplace, each employee is responsible for his/her own safety as well as the safety of others on the work site. The employee shall use all equipment provided in a safe and responsible manner to achieve the intent of the HASP. All project personnel working at the site will be responsible for understanding and complying with the Health and Safety Plan requirements.

3.6 Visitors

All site visitors will be required to read the HASP and sign the Site Log/Compliance Agreement Form (Appendix F). Visitors will be expected to comply with relevant OSHA requirements and provide their own personal protective equipment (PPE) required by the HASP. Any visitors who do not adhere to the provisions of the HASP will be requested to leave the work area. Visitors who have not met OSHA training and medical surveillance requirements are not permitted to

enter areas where exposure to hazardous materials or operating equipment is possible. Exceptions will be strongly discouraged, but they will be made on a case-by-case basis under the following conditions:

- respirators are not required,
- the visitor's time on site is limited,
- the visitor is given a pre-entry briefing,
- visitors are accompanied by trained personnel at all times, and
- EHSC or SSO approval is obtained.

4.0 HAZARD ANALYSIS AND RISK MITIGATION

The All site hazards must be identified and eliminated or controlled as best as possible. Physical, chemical, and biological hazards may be encountered on the site. An activity hazard analysis (AHA) involves a complete review of potential hazards and recommended

4.1 Chemical Hazards

Information from previous site investigations suggests that volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), lead, and petroleum hydrocarbons are contaminants of concern (COCs) at Alameda Point. In addition, chemicals used for instrument calibration and sample preservation may be encountered during fieldwork.

Airborne exposure is considered to be a potential exposure pathway at Alameda Point from inhalation of particulates or vapors originating from sampling activities. Airborne exposure to personnel outside the exclusion zone is not likely to occur based on the sampling techniques employed at this site. Based on the low anticipated concentration of the COCs and dispersion through air, airborne exposure impacts to workers at Alameda Point are also considered to be insignificant.

Air monitoring, to determine if flammable, explosive atmospheres, or personal hazards are being generated at the time of sampling activities may be conducted on site.

Information from Contaminant Fact Sheets has been utilized in performing the chemical hazard analysis. Chemical fact sheets are available in Appendix D. To mitigate potential chemical hazards at the site, recommended controls must be implemented (Table 1). In addition, PPE (Section 5.5) and air monitoring equipment (Section 6.0) must also be utilized to evaluate airborne concentrations and protect workers.

4.2 Physical Hazards

Physical hazards associated with this project that could result in accidents and personal injury to the work force, as well as operational problems, have been listed in the activity hazard analysis (Table 1). Associated recommended controls must be implemented.

4.2.1 Laser- Induced Fluorescence Probe Operation

The penetrometer probe is pushed into the ground by a hydraulic press. Once in the ground, the laser is fired down the optical fiber. The laser excites the soil adjacent to the probe. A second

fiber collects and transmits the response from the soil to instruments in the truck. The intensity of the response is proportional to the concentration of petroleum, oil and lubricants in the subsurface soil. Chemical hazards are not expected during this operation. Physical hazards may include improper lifting, contact with underground utilities, improper use of laser equipment, heavy equipment operation, and exposure to high noise levels. Observing safe work practices, Site Control Measures, and the Specific Standard Operating Procedures, should eliminate physical hazards.

4.2.2 Industrial Hazards

Prior to starting intrusive activities, all known underground utilities and lines shall be located and marked on the ground and on a site map. The initial site safety orientation meeting for all personnel working on-site shall include a review of the site map with underground utility locations clearly marked. Overhead power lines may present a hazard to equipment and personnel. To prevent equipment contact with power lines and to prevent arcing, adequate clearance must be maintained during drilling or operations and should not be exposed to water or other liquids. A ground fault circuit interrupter (GFCI) outlet or cord must be used outdoors and in any area where water may be present. Large power tools and equipment should be lifted properly to prevent back injuries. Safety glasses with side shields, ear protection and safety toed-boots will be worn while operating power tools or equipment.

4.3 Biological Hazards

The multiple biological hazards that are present at this site are listed in the activity hazard analysis (Table 1). Associated recommended controls must be implemented. Additional details are given below.

4.3.1 Insects, Snakes, and Animal Bites

The primary insect hazards for fieldwork are bees and spiders. Snakes and other animals may also be encountered, but less frequently. Spiders prefer the warm, wet environments provided by well casings and vault enclosures. Snake and other small animals may be found under rocks, plastic sheeting, tires, etc.

Before initial assignment, personnel with known allergic reactions to insect stings or bites will be identified and field supervisors made aware of this condition. In all cases, a victim suspected of being bitten will be handled as an emergency requiring medical attention.

Animal bites, insect stings, and ticks can cause localized swelling, itching, and minor pain that can be handled by first aid treatment. However, sensitized individuals can experience more serious effects such as anaphylactic shock. This type of shock can lead to severe reactions in the circulatory, respiratory, and central nervous system, and in some cases, even death. Snakebites will be handled as an emergency requiring calling for an ambulance. The Project Health and Safety Officer will identify personnel with a known reaction to bites and stings at the safety orientation meeting. No attempts should be made to capture any wild or semi-wild animals due to the possibility of a bite or parasitic infestation.

4.3.2 Hantavirus and Arenavirus

Animal and bird droppings often contain mold, fungus, or bacteria posing a significant respiratory hazard that can cause lung diseases and allergies. Hantavirus and Arenavirus both

occur in the area and are known to be transmitted by exposure to rodent droppings. Rodents shed the virus in their saliva, urine, and feces. Particles and droplets containing the virus can become airborne, spreading the virus as humans breathe the contaminated air.

Personnel will be instructed not to touch droppings, and to wear gloves and Tyvek at a minimum when going into limited access areas such as crawl spaces and high ceiling that may have become refuges or nesting areas. Good hygiene practices will help to minimize the potential for exposure to these hazards.

4.3.3 West Nile Virus

West Nile virus is primarily transmitted among wild birds by infected mosquitoes. The infected mosquitoes can also transmit the virus to humans, causing a mild flu-like illness that typically lasts for a few days. In rare cases, the virus can cause encephalitis, which is an inflammation of the brain.

The following precautionary measures against West Nile Virus are included for personnel, whose duties will include fieldwork:

- Maximize skin coverage using long sleeves;
- Apply an insect repellent containing DEET™ to thin clothing and exposed skin; and
- Avoid those times of day when mosquitoes are most active (dawn and dusk).

4.4 Task-Specific Hazard Analysis and Mitigators

The task-specific activity hazard analysis is conducted prior to work commencement and is based on available information. The activity hazard analysis will be revised as needed, depending on work conditions and as additional requirements are encountered. Any changes to the hazard analysis will be noted on the field copy of the HASP, with notations indicating the directions provided to onsite personnel, as well as the date and time changes are determined to be necessary. Associated recommended controls for task-specific hazards are presented in Table 1 and must be implemented.

Tasks associated with SCAPS at Alameda Point include:

- Instrument calibration
- Groundwater/soil monitoring and sample collection.
- Cone penetrometer

5.0 GENERAL HEALTH AND SAFETY REQUIREMENTS

5.1 Medical Monitoring of Personnel

All medical monitoring of RBA work force personnel is determined based on the results of industrial hygiene surveys, prior site characterization, and is exposure driven. In the absence of industrial hygiene data, medical personnel will make a decision on placement in medical surveillance programs based on knowledge of the workplace, job requirements and review of employee's occupational history. If necessary, physicals or stressor-specific evaluations will be performed by a qualified physician board certified in occupational medicine. Subsequent exams are performed as frequently as medical authorities determine is necessary for the safety of the individuals involved. RBA medical consultants will determine the content of the physical. At a

minimum, all RBA employees at the site shall be medically cleared to wear an air-purifying respirator.

5.2 Restricted Access Work Zone

For this project, the work area may include three separate zones: an exclusion (~hot~) zone, a contamination reduction (decon) zone, and a support zone.

5.2.1 Exclusion Zone

The exclusion zone consists of area in the vicinity of any sampling activities. All employees will use appropriate PPE when working in those areas. The exclusion zone will be defined as an area where there is a possible respiratory and/or contact health hazard. In most instances this area will be a ten-meter radius from the excavation. Cones, yellow caution tape, or other appropriate means will identify the location of exclusion zones.

5.2.2 Contamination Reduction Zone

All personnel entering or leaving the exclusion zone will pass through this area in order to prevent any cross-contamination and for the purpose of accountability. Decontamination will be performed in the contamination reduction zone. Tools and any equipment or machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the exclusion zone. Personal protective outer garments and respiratory protection will be removed in the contamination reduction zone and properly labeled.

5.2.3 Support Zone

The support zone consists of an area outside the contamination reduction zone. The support zone will be located to prevent employees from being exposed to any particulate levels above regulatory limits. Eating, drinking, or smoking will be permitted in the support area only after washing face and hands.

5.3 Work Limitations

Work limitations include the following:

- No eating, drinking or smoking in the exclusion zone or contamination reduction zone.
- Eye protective equipment must be worn by all persons when eye sight hazards exist.
- Facial hair must not interfere with the fit of the respirator.
- Work to be conducted during day light hours except in an emergency.

5.4 Safety Orientation Meeting

All field personnel must attend a safety orientation meeting before commencing the fieldwork. The meeting will be scheduled and conducted by the PM, EHSC, and the SSO. The meeting will include presentation of the HASP and required signature on the Site Log/Compliance Agreement Form (Appendix F). In addition, all personnel entering the Exclusion Zone or Contamination Reduction Zone (EZ/CRZ) are required to log-in/ log-out from the site.

5.5 Protective Equipment and Clothing

All on-site personnel will be equipped with PPE appropriate for the hazardous material being handled and the nature of the work being completed. The levels of PPE to be used for work tasks have been selected based on known or anticipated hazards and expected concentrations of

materials found on the site. Personnel conducting site activities in Level D PPE will wear the following:

- Work uniform (disposable or reusable)
- Steel-toed boots with shanks
- Chemical-resistant safety glasses
- Hearing protection (when appropriate)
- Hard hat (when appropriate)
- Leather work gloves for equipment operators (optional)

Level D PPE will be modified to include additional protective equipment where skin contact with contaminants is reasonably anticipated. Disposable chemical resistant clothing will be worn when sampling and entering areas with known contamination.

The initial levels of PPE required for each task are provided in Appendix E. Required equipment and types of protective clothing materials are listed, as well as an indication of the initial level of protection. The level of protection may be upgraded or downgraded and PPE level changes must be indicated in the field logbook. Modified Level D PPE will be required if splashes from chemical or physical contact with contaminated groundwater is likely during sampling activities and the decontamination of equipment. Level D or modified Level D PPE will be upgraded to Level C if air monitoring indicates airborne organic vapor concentrations greater than relative action levels presented in Table 6.1. The need to upgrade from Level C to Level B PPE is not anticipated on this project.

If respirators are worn, workers must adhere to the Respiratory Protection Program.

5.6 Safety Equipment and Materials

Field personnel from RBA shall ensure the following safety equipment and materials are readily available at each work site:

- First-aid kit
- Emergency eyewash station (ANSI Standard Z-358.1-2004 or later)
- Fire extinguisher (20 pound A,B,C-rated type)
- Shovel, Broom and plastic sheeting (6 or 10 ml)

6.0 AIR MONITORING

The safe work practices during work tasks are sufficient to protect field personnel against exposure to airborne hazardous substances. However, air monitoring to determine if flammable or explosive atmospheres are being generated, at the time of drilling and sampling activities, will be conducted. This air monitoring will help to determine appropriate level of PPE for individual work tasks. If personal air samples are taken, they shall be collected in accordance with NIOSH or OSHA methods for petroleum distillates and analysis shall be conducted by a competent industrial hygiene laboratory.

6.1 Organic Vapors

Air monitoring for organic vapors has been completed on several remediation jobsites at various military installations. In each case, a negative exposure assessment has been obtained. Documentation of these events has been provided to the Navy Public Works Center Safety Department and the Navy Medical Center Industrial Hygiene Department.

Regardless, air monitoring may be done using a direct reading analyzer such as a Neotronics Exotox 40 or a Foxboro Toxic Vapor Analyzer (TVA) and may include indirect air sampling. Total organic compound concentrations may be obtained before beginning any work tasks, throughout the day, and in response to any community persons reporting unusual odors. Measurements may be taken both around the job site and in the breathing zone of personnel working in the area. All breathing zone samples with a sustained reading exceeding action levels presented in section 6.3 and lasting at least 5 minutes in duration shall be evaluated.

If TVA levels indicate sustained levels greater than 25-ppm organic vapors, indirect air monitoring shall be considered for RBA personnel. The method used shall be depending upon conditions present. If a 2 ml bulk sample is available, monitoring for petroleum distillates may be performed. If no bulk sample is available, indirect air monitoring for total hydrocarbons may be conducted.

National Institute for Occupational Safety and Health (NIOSH) Method #1550 for petroleum distillates requires a calibrated sampling pump ranging from 0.01 to 0.2 liters per minute, to collect a volume of 1.3 to 20 liters, and a 100/50 charcoal tube, with a 2 milliliters (mL) bulk liquid sample.

OSHA Method #7 for total hydrocarbons using a calibrated sampling pump ranging from 0.01 to 0.2 liters per minute, to collect up to 50 liters of air on 400/200 charcoal tube, or a 3M passive dosimeter to collect up to 8 hours of area samples.

6.2 Air Monitoring Action Levels

Level D PPE will be worn only when sustained oxygen and toxics exposure is acceptable and if TVA readings are less than 10 parts per million (ppm). If TVA measurement is greater than 10 ppm, air-purifying respirators must be worn. If concentrations of organic vapors exceed 25 ppm supplied air respirators must be worn and if concentrations of organic vapors exceed 250 ppm, the site activities will be immediately discontinued, the personnel will be directed to evacuate the area, and the project manager, along with the site supervisor, will consult with the EHSC about whether or not to continue site activities. Table 6.1 summarizes the air monitoring action levels identified for this project.

Table 6-1. Air Monitoring Action Levels

CHEMICAL	INSTRUMENT	READING	REQUIRED ACTION	MONITORING FREQUENCY
Organic Vapors	Foxboro TVA 1000	< 10 ppm	Level D	Upon request by on-site personnel, SSO, PM, or EHSC.
		>10 - 25	Modified Level D	
	Foxboro TVA 1000	> 25 ppm	Level C – Use detector tubes, consult CIH	
		> 250 ppm	Stop Work	

6.3 Calibration and Maintenance of Air Monitoring Survey Equipment

The EHSC will designate a competent individual familiar with the device being used. Employees operating the equipment will understand action levels, operate, perform minor maintenance, and calibrate in accordance with manufacturer guidelines.

Air monitoring equipment will be calibrated before and after each period of use in accordance with manufacturer's recommendations and standard industrial hygiene practices. On-site personnel will perform only routine maintenance (such as changing batteries or lamps and cleaning lamps and fans). A trained service technician will perform any additional maintenance.

7.0 EMPLOYEE TRAINING

The OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements, as described in the Code of Federal Regulations (CFR), 29 CFR 1910.120, apply to those persons conducting field work. The regulation states that all personnel involved in characterization or remediation of an uncontrolled hazardous waste site shall be required to have 40 hours of certified training and three days of supervised field experience. Additionally, personnel in a supervisory position will receive supervisor training as per 1910.120(e)(4). A trained Site Supervisor will be on site during the entire field investigation. In compliance with 29 CFR 1910.120, RBA Environmental Department protocol requires "general site workers," those individuals performing field activities such as drilling and collecting soil samples, to have completed the appropriate OSHA HAZWOPER training course.

Personnel who are on-site occasionally to perform inspection and sampling activities and are unlikely to experience exposure over the permissible exposure limit (PEL) and published exposure limits, may be considered "workers on site only occasionally for a specific limited task." These workers must have 24 hours of training and one day of actual field experience. Employees who have minimal (low risk) exposure or low probability of exposure to hazardous substances are covered by other OSHA standards, such as the Hazard Communication standard, 29 CFR 1910.120.

7.1 Training and Medical Clearance Documents

Copies of current OSHA training and medical clearance documents for RBA personnel are available at the RBA Environmental Department Headquarters. Upon request, copies of these documents will be provided via fax, hand-delivery, or other means.

8.0 STANDARD WORK PROCEDURES

Work procedures will be discussed at the tailgate meeting conducted each morning prior to the start of fieldwork. The SAP created for this project will be available at the site during fieldwork activities.

8.1 Area Marking

Cones, or construction barricades and/or yellow caution tape will bound all field activities, including but not limited to drilling and sampling activities.

8.2 Heavy Equipment Operation

Heavy equipment operation activities may be performed at this site. At a minimum, sampling personnel will wear Level D PPE and be equipped to don air-purifying respirators when sustained readings equal or exceed air monitoring action levels.

8.3 Safe Work Practices

Safe work practices for site activities include the following:

- a) All site personnel will enter a designated exclusion zone only through the contamination reduction zone (CRZ). All personnel leaving an exclusion zone must exit through the CRZ and undergo the decontamination procedures.
- b) Only vehicles and equipment necessary to complete work tasks (such as drilling rigs and support trucks) will be permitted within an exclusion zone. All nonessential vehicles and equipment will remain within the support zone.
- c) Containers (such as drums) will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.
- d) All personnel will avoid contact with potentially contaminated substances. Walking through puddles or mud and kneeling on the ground will be avoided whenever possible.
- e) Food and beverages, use of tobacco products, and application of cosmetics will not be permitted in the exclusion zone or CRZ.
- f) All personnel leaving the exclusion or contaminant reduction zone will be required to wash their hands and faces before eating, drinking, smoking, or applying cosmetics.
- g) Site personnel will observe each other for signs of toxic exposure and heat or cold stress. Indications of adverse effects include but are not limited to:
 - Changes in complexion and skin discoloration
 - Changes in coordination
 - Changes in demeanor
 - Excessive salivation and papillary response
 - Changes in speech patterns
- h) Site personnel will inform each other of non-visual effects of illness, such as
 - Headache
 - Dizziness
 - Nausea
 - Blurred vision

- Cramps
- Irritation of eyes, skin, or respiratory tract

9.0 COMMUNICATION PROCEDURES

A cellular phone and/or radios will be present on site while field work is in progress for the purpose of obtaining timely medical care, and additional emergency and logistical assistance.

Personnel in the Exclusion Zone shall remain in regular contact (daily before and after work commences) with either the PM, HSM or SSO. A failure of communication requires an immediate re-establishment of communication or cessation of work until communications can be reestablished.

A single 15-second long horn blast is the emergency signal that all personnel should leave the exclusion zone.

The following standard hand signals will be used in case of radio communication failure:

- Hand gripping throat: Out of air, can't breathe
- Grip partner's wrist: Leave area immediately
- Hands on top of head: Need assistance
- Thumbs up: Ok, I understand, am all right
- Thumbs down: No, negative

9.1 Emergency Action Plan Review

This Emergency Action Plan will be reviewed with each employee covered in this HASP when the employee is initially assigned to the job, when the employee's responsibilities under the plan changes, and when the plan is changed.

10.0 DECONTAMINATION PROCEDURES

In general, all equipment used during sampling activities is required to be decontaminated, especially if non-aqueous liquids are encountered. The equipment decontamination procedures described in the following sections are based on guidelines appropriate for low-level contamination. When appropriate, Liquinox7 or Alconox7 cleaning solutions and de-ionized water rinses will be used to decontaminate equipment. Wastewater generated by equipment decontamination activities will be stored in 55-gallon containers or DOT approved containers. The PM will label the wastewater and will arrange for this investigation-derived waste to be transported to an authorized disposal facility.

10.1 Reusable Equipment

Reusable equipment will be decontaminated before and after each use. De-ionized water will be used for the following sampling equipment decontamination procedures:

- Scrub the equipment with a brush in a bucket containing Liquinox7 or Alconox7 solution and potable distilled water.
- Triple-rinse the equipment with distilled water and allow it to air dry.

- Reassemble the equipment and place it in a clean area on plastic or aluminum foil. If aluminum foil is used, wrap the equipment with the dull side of the aluminum foil toward the equipment.

10.2 Personnel

Remove and bag disposable chemical-resistant gloves and clothing (i.e. Tyvek) in a plastic trash bag. If cotton coveralls are used, bag and wash prior to re-wearing. Remove reusable respirators, if worn, wash in TSP and water and rinse. Wash hands and face; take a shower and wash hair as soon as possible after leaving the site.

10.3 Investigation-Derived Material Disposal

Wastes that are anticipated to be generated during the fieldwork may include contaminated soils, decontamination water, PPE. Where possible, these wastes will be containerized on site and stored temporarily in 5 or 55-gallon drums or other suitable containers. Disposal of these wastes will be based on analytical results of the item in question. Non-contaminated wastes will be disposed of on site as non-hazardous solid wastes. Contaminated wastes will be transported to an authorized disposal facility. Waste classified as "Hazardous Waste" must be transported in accordance with current regulations. The PM shall maintain copies of all turn-in documents, bill-of lading, uniform hazardous waste manifests, or waste acceptance forms demonstrating ultimate disposal of these wastes.

11.0 CONFINED SPACE ENTRY

The tasks for this project do not involve confined-space entry.

12.0 UPDATES OF HEALTH AND SAFETY PLAN

Updating of this Health and Safety Plan shall be done as frequently as necessary to ensure safe work conditions. Suggestions should be brought to the attention of the PM, EHSC, or SSO. If unforeseen situations arise, this plan will be updated accordingly.

13.0 EMERGENCY RESPONSE

13.1 Physical Injury

It is required that at least two personnel trained in adult first aid/CPR and bloodborne pathogens, including the SSO, are on-site at all times during fieldwork activities. The SSO will have initial controlling authority during an emergency. In the event of an accident resulting in physical injury, emergency service personnel will be contacted immediately. First aid will be performed immediately, commensurate with training and seriousness of the injury. Severely injured personnel are to be transported only by emergency service personnel and/or by ambulance personnel, unless a life-threatening condition is judged to exist that must be addressed immediately. In the event injured workers require decontamination, site personnel trained to the first responder operations level will implement basic decontamination procedures. If emergency or ambulance personnel transport injured personnel to the hospital, the hospital will be selected at the discretion of the emergency/ambulance personnel. The hospital selected may or may not be the hospital listed in this document. Site emergency contact numbers are available in Appendix B. Hospital directions and route maps are available in Appendix C.

13.2 Emergency Escape Route

Workers will evacuate the exclusion zone by the most expedient route available, preferably through the contamination reduction zone, and meet at the lead equipment truck for a head count. In all situations when an emergency results in the evacuation of the exclusion zone, personnel must not re-enter until:

- The conditions causing the emergency have been corrected.
- The existing hazards have been reassessed.
- The Site Safety Plan has been reviewed.
- Site personnel have been briefed on any changes to this Site Safety Plan.

13.3 Fire or Explosion

In the event of a fire or explosion at the site, the Fire Department will be contacted as soon as possible and evacuation of the site will begin immediately.

If any unexploded ordinance (bullet casing inside a cartridge) is found, RBA will secure the area and notify local security. If there is any doubt, all activities will be stopped, otherwise, unexploded ordinance will be segregated and secured for removal by EOD.

13.4 Protective Equipment Failure

If any worker in the exclusion zone experiences a failure of protective equipment that affects the worker's personal protection, the worker and all coworkers will immediately leave the exclusion zone. Reentry to the exclusion zone will not be permitted until the protective equipment has been repaired or replaced and the cause of the equipment failure has been determined and is no longer considered a threat.

13.5 Spill Control and Containment Procedures

During all site activities, nearby storm drains and catch basins will either be monitored, covered or absorbent material will be placed around the drain opening. Chemicals or hazardous substances could be spilled during site tasks as a result of either a transportation accident, rupture of underground piping, decontamination of equipment, or improper handling of investigation derived waste during off-loading. The emergency plan will be activated in the event of unplanned spill of hazardous or unknown substances.

In the event of any spill at the site, the PM, EHSC and SSO will be notified immediately by whoever first witnesses the emergency event. As soon as the spill is discovered, all nonessential workers will be directed to evacuate the immediate area to reduce the likelihood of spreading contamination or being exposed to contamination. First responders at the operational level who have received at least eight hours of training will proceed to the spill area with a spill cleanup and control kit, including absorbent material. Response personnel will wear the appropriate PPE. Attempts will be made to stop the source of the spill immediately. Absorbent material will be placed in the area around the release to prevent further migration.

The EHSC or SSO will remain at the spill area until the area has been cleaned, inspected, and readied for reentry. In the event of a spill and incident report will be prepared and available for review.

TABLE 1
ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS

Site - Alameda SCAPS

AHA conducted by Craig Haverstick

April 4, 2007

Principal Steps	Potential Health and Safety Hazards	Recommended Controls
Instrument Calibration	Chemical Exposure (Skin Absorption, Eye Injury, and Inhalation)	<p>Wear chemical resistant gloves while handling calibration fluid.</p> <p>Wear safety goggle or laser glasses while handling calibration fluid and working with laser.</p> <p>Work in well ventilated area.</p> <p>Be aware of chemical properties of calibration fluid.</p> <p>Inspect calibration fluid containers for cracks or leaks.</p> <p>Tighten all calibration fluid caps prior to storage.</p> <p>Follow good housekeeping procedures in work space.</p>
Groundwater and Soil Sampling	Solar Radiation	<p>Wear protective clothing to prevent exposure to the sun.</p> <p>Use sunscreen and reapply as needed.</p> <p>Use shade to minimize UV exposure.</p>
	Bees, Insects, Vermin, and Snakes	<p>Advise SHSO if you are allergic to bees or other insects prior to fieldwork.</p> <p>Learn which species are indigenous to the site.</p> <p>Thoroughly inspect well boxes prior to work.</p> <p>Be aware of potential species locations (culverts, drainage pipes, junk piles, or dense shrubbery).</p> <p>Do not agitate or disturb bee hives.</p> <p>Avoid wearing perfumes, hair spray, or scented lotions.</p> <p>Keep area as quite and calm as possible.</p> <p>Bring snake bit kit into field.</p> <p>If stung, remove stinger as quickly as possible by raking</p>

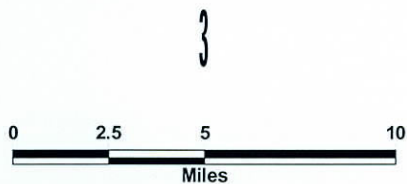
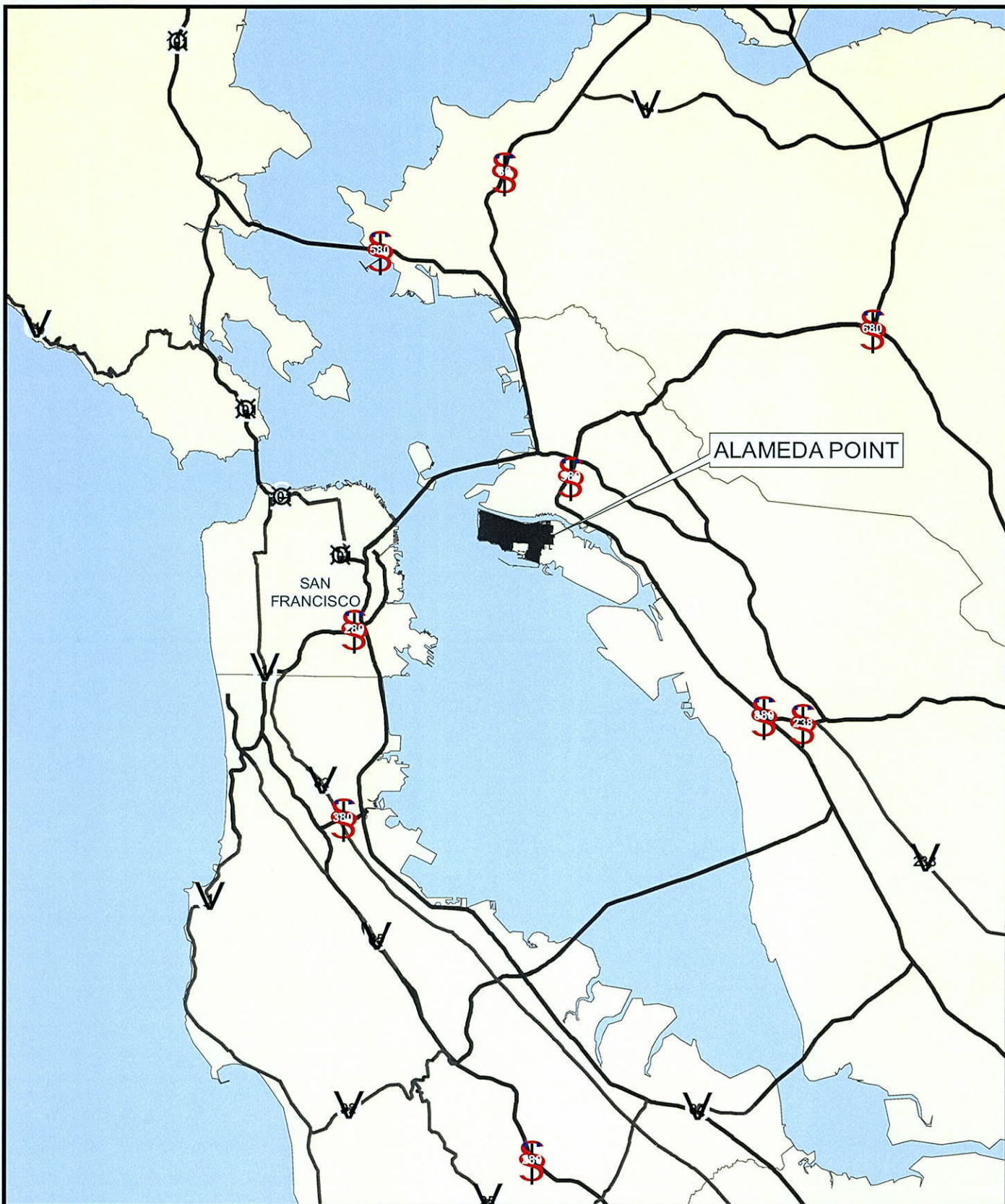
Groundwater and Soil Sampling	Bees, Insects, Vermin, and Snakes	<p>your fingernail across it to lessen the amount of venom entering your body.</p> <p>Report any bites/stings to the SHSO and seek medical attention immediately.</p>
	Slip, Trip, and Fall	<p>Wear proper footwear at all times.</p> <p>Use caution when walking on slopes or were moisture is present.</p> <p>Follow good housekeeping procedures in work space. Maintain proper lighting at the site. Remove or clearly mark objects that pose tripping hazards. Walk, do not run while on site.</p> <p>Prevent water accumulation where practicable.</p> <p>Carry objects in a manner that allows you to see in the area you are moving in.</p>
	Hand Tools	<p>Thoroughly inspect tools prior to use.</p> <p>Protect tools from corrosion and damage.</p> <p>Wear gloves and eye protection while using hand tools.</p> <p>Replace or repair damaged tools promptly.</p> <p>Do not store loose tools on ledges or were they may fall.</p>
	Compressed Gas (CO2)	<p>Wear safety glasses assembling the purging system.</p> <p>Inspect tank and fittings for corrosion and deformities prior to use.</p> <p>Insure that all valves are in the closed position prior to attaching or disconnecting the regulator.</p> <p>Inspect all gaskets and replace when necessary.</p> <p>Use the proper size of wrench on brass fittings to reduce scarring.</p>
	Chemical Exposure (Skin Absorption, Eye Injury, and Inhalation)	<p>Wear chemical resistant gloves while sampling.</p> <p>Wear safety goggle or glasses while sampling.</p> <p>Always work up-wind if possible.</p> <p>Be aware of chemical properties of preservatives and COC's.</p> <p>Do not overfill sample containers.</p>

Groundwater and Soil Sampling	Chemical Exposure	<p>Inspect sample containers for cracks or leaks.</p> <p>Tighten all sample container caps prior to storage.</p>
	Drum and Container Handling	<p>Bulging drums or containers are an indication of pressure build-up. Open all drums or bungs extremely slowly.</p> <p>Utilize drum container handling equipment whenever possible.</p> <p>Label and identify drums and containers.</p> <p>Inspect the integrity of the drum container before moving.</p> <p>Have a clear view of the available pathway when moving drums. If needed, an additional person should be available to provide guidance.</p> <p>Never stand on drums or containers.</p> <p>Use non-sparking tools and appropriate grounding and bonding equipment.</p> <p>Spill control equipment shall be onsite in areas where spills ruptures or leaks may occur.</p>
Drilling	Drilling Hazards	<p>Wear hard hats, steel toed boots, hearing protection and safety glasses at all times when performing drilling operations.</p> <p>Conduct a survey, prior to bringing drilling equipment to the job site, to identify overhead electrical hazards, potential subsurface hazards, and terrain hazard.</p> <p>Shutdown devices should be tested at the beginning of each day.</p> <p>Do not transport drilling equipment with the mast in the upward position.</p> <p>Extend outriggers per the manufacturer's specifications. Monitor weather conditions. Operations shall cease during electrical storms or when electrical storms are imminent.</p> <p>Wearing of loose clothing (e.g., open shirts, hooded sweatshirts, etc) is not permitted.</p>

Drilling	Drilling Hazards	<p>Verbally alert employees and visually ensure employees are clear from dangerous parts of equipment prior to starting or engaging equipment.</p> <p>Control dust using dust suppression techniques.</p> <p>Clean augers only when the rotating mechanism is in neutral and the auger is stopped. Tools such as long-handled shovels shall be used to remove cuttings from the auger.</p> <p>Cap and flag open boreholes; open excavations shall be barricaded.</p> <p>Check cables for frays and hydraulic hoses for leaks daily.</p>
	Heavy Equipment	<p>Yield to heavy equipment.</p> <p>Listen for warning signals on heavy equipment.</p> <p>Perform a visual inspection and walk around parked heavy equipment before moving to assure that equipment is in good condition and that there are no personnel on the ground that could be injured or objects that could be damaged by vehicle movement.</p> <p>Wear hearing protection if required.</p> <p>Wear traffic vests for increased visibility.</p> <p>Maintain eye contact with the heavy equipment operator when working near equipment.</p> <p>Be aware of changes in sound of equipment which may indicate a change in direction or activity.</p>

APPENDIX A

SITE MAPS



BASE LOCATION MAP

ALAMEDA POINT ALAMEDA, CALIFORNIA

Richard Brady and Associates
Engineers and Constructors
4909 Murphy Canyon Road Suite 220
San Diego, California 92123
Telephone 858.496.0500 Fax 858.496.0505

DATE: Mar 2, 2007
FILE: AlaBaseLoc

FIGURE
1-1

ALAMEDA POINT

IR SITES 13, 19, & 22

3

0 1,000 2,000 4,000
FEET

MAP PROJECTION: NAD 27 CALIFORNIA STATE PLANE 3, SURVEY FEET

SITE LOCATION MAP

ALAMEDA POINT
ALAMEDA, CALIFORNIA

Richard Brady and Associates
Engineers and Constructors
4909 Murphy Canyon Road Suite 220
San Diego California 92123
Telephone 858.496.0500 Fax 858.496.0505

DATE: Mar 1, 2007
FILE: AlaBaseOv

FIGURE:
2-1

APPENDIX B
SITE EMERGENCY PHONE NUMBERS

Appendix B

SITE EMERGENCY PHONE NUMBERS

Hazards of Concern: Volatile organic compounds (VOC's), lead, polynuclear aromatic hydrocarbons (PAHs), and petroleum hydrocarbons.

Minimum Level of Protection: Level D; Modified Level D
(if necessary and based on air monitoring)

EMERGENCY PHONE NUMBERS:

National Response Center:	1-800-424-8802
Poison Control:	1-800-451-1428
Fire, Police:	9-911

RBA ENVIRONMENTAL CONTACTS:

Program Manager:	Timothy Shields (619) 571-4176
Project Manager:	Donald McHugh (619) 316-0597
RBA Health & Safety:	Craig Haverstick (619) 571-4178

MEDICAL CENTERS

Alameda Hospital
2070 Clinton Ave, Alameda CA 94501
(510) 522-3700

NAVY POINTS OF CONTACT:

Police and Fire 911

Ms. Michelle Hurst (RPM)
Mr. Douglas DeLong, Alameda Point EMC
Mr. Gregory Grace, ROICC

Office: (619) 532-0939
Office: (415) 743-4713
Office: (510) 749-5940

APPENDIX C
MEDICAL FACILITIES ADDRESS AND ROUTE MAPS

Appendix C

MEDICAL FACILITIES ADDRESS AND ROUTE MAPS

The following map reflects an overview of the medical facility within a reasonable travel distance from the work site.



ALAMEDA HOSPITAL AND EMERGENCY ROOM

2070 Clinton Ave, Alameda CA 94501 (510) 522-3700

Directions

Exit base via the Central Ave gate.

East on Central Ave for approx. 1.6 miles.

Right onto Encinal Ave. Continue on Encinal Ave. for approx 0.8 miles.

Right on Willow St. and follow signs to hospital.

APPENDIX D
CONTAMINANT FACT SHEETS

This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyoo'el oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- ☐ Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- ☐ Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.

- ☐ Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- ☐ Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- ☐ Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- ☐ Using a home kerosene heater or stove, or using fuel oils at work.
- ☐ Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- ☐ Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- ☐ Touching soil contaminated with fuel oils.
- ☐ Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of

the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m³) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



APPENDIX E

PERSONAL PROTECTIVE EQUIPMENT PER TASK

PERSONAL PROTECTIVE EQUIPMENT PER TASK

Applies to Task: Soil Sampling, Drilling, Hand Augering					
Modified Level D		Level C		Level B	
Equipment	Material /Type	Equipment	Material /Type	Equipment	Material /Type
<input type="checkbox"/> Protective clothing	Tyvek or equivalent	<input type="checkbox"/> Full face APR	Cartridge type:	<input type="checkbox"/> SCBA (Pressure demand)	
<input checked="" type="checkbox"/> Outer gloves	Latex or nitrile (powder free)	<input type="checkbox"/> Half mask APR	Cartridge type:	<input type="checkbox"/> Air line system (Pressure demand)	
<input type="checkbox"/> Outer boots		<input type="checkbox"/> Protective clothing		<input type="checkbox"/> Protective clothing	
<input checked="" type="checkbox"/> Safety glasses	ANSI approved	<input type="checkbox"/> Outer gloves		<input type="checkbox"/> Outer gloves	
<input checked="" type="checkbox"/> hard hat	ANSI approved	<input type="checkbox"/> Inner gloves		<input type="checkbox"/> Inner gloves	
<input checked="" type="checkbox"/> Steel toe boots	ANSI approved	<input type="checkbox"/> Outer boots		<input type="checkbox"/> Outer boots	
<input checked="" type="checkbox"/> Hearing protection	Ear plugs	<input type="checkbox"/> hard hat		<input type="checkbox"/> hard hat	
<input checked="" type="checkbox"/> Other	Long pants, normal work clothes	<input type="checkbox"/> Safety glasses		<input type="checkbox"/> Safety glasses	
		<input type="checkbox"/> Steel toe boots		<input type="checkbox"/> Steel toe boots	
		<input type="checkbox"/> Hearing protection		<input type="checkbox"/> Hearing protection	
		<input type="checkbox"/> Other		<input type="checkbox"/> Escape respirator	
				<input type="checkbox"/> Safety rope	
				<input type="checkbox"/> Other	

APPENDIX F
SITE LOG/COMPLIANCE AGREEMENT FORM

I have read and understand this Site Health and Safety Plan and hereby agree to comply with all safety requirements outlined herein. (All site personnel must sign below indicating that they have read and understand this HASP and its provisions.)

[illegible]